

# THE FEEDING AND CARE OF INFANTS AND YOUNG CHILDREN

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edition

Dr. Shanti Ghosh



VHAI



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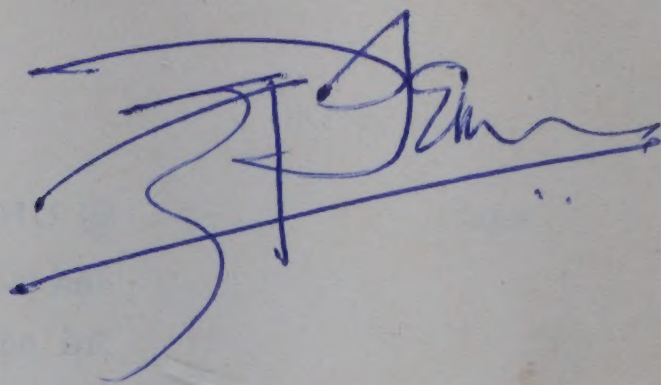
The joy of being healthy







# The Feeding and Care of Infants and Young Children



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Voluntary Health Association of India — New Delhi (INDIA)



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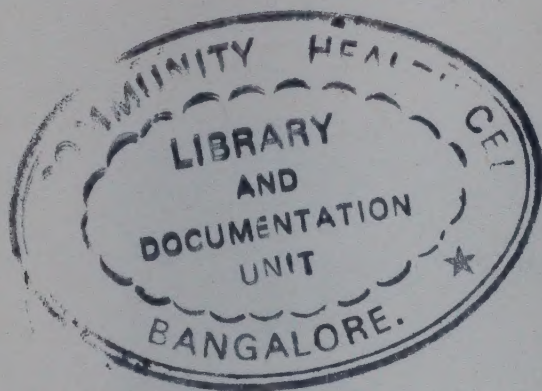
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## FOREWORD

The Protein Advisory Group of the United Nations System published a "Manual on Feeding Infants and Young Children", by Margaret Cameron and Yngve Hofvander, with the hope that it would be adapted to national conditions. UNICEF is happy that so eminent and experienced a person as Dr Shanti Ghosh has done this for India. Her book is more than an adaptation of the PAG manual, as its title suggests. We are grateful to WHO and FAO staff in New Delhi who have commented on the draft and made suggestions, but responsibility for the book remains with the author.

The scope of the book and its intended audience is set out in the Introduction. UNICEF hopes that it will be found useful and practical, and will contribute to the welfare of India's children.

August 1976

UNICEF  
New Delhi.







## INTRODUCTION

India, along with many other developing countries, has a young population—38 per cent being under the age of 14 years, and 16 per cent under the age of 6 years. The problems of infection and nutrition are great in this group, particularly in children under 5, who are experiencing rapid growth and are therefore more vulnerable. Both mortality and birth rate are high. There is a rapid turnover, a new child replacing the old very quickly. Infant mortality is around 120 per 1000 live births on the whole and is much higher in rural than in the urban areas. Forty per cent of all deaths occur under the age of 5 years. The main immediate causes of death are diarrhoeal disorders and respiratory diseases even though malnutrition is an important underlying cause in most cases. Low birth weight too is an important contributory factor. Repeated illnesses coupled with malnutrition result in stunting, and it is feared that such children may not be able to achieve their full intellectual potential.

India is a country of villages and about 80 per cent of the people live in them. The income levels are low and about half the population live below the poverty line. Several surveys have shown that a large number of people eat less food than they need, the worst sufferers being pregnant women and lactating mothers and children. The child in the womb, and the child at the breast, are influenced by the nutrition of their mothers. Thirty per cent of school children are malnourished. There are about 100 million pre-school children out of whom 3 to 4 million suffer from severe types of malnutrition, and probably 1 million die because of this every year.

While poverty is an important limiting factor for buying enough food, the rampant malnutrition is not all due to poverty. There is widespread ignorance about the essentials of child care, including nutritional requirements and the common foods that supply the necessary nutrients. Most mothers and health workers have little idea of how much food a child needs for adequate growth and nutrition, and hence the advice given is often conflicting and inaccurate. Often the foods suggested are expensive and beyond the reach of the community. The main purpose of this book is to emphasise the fact that the child can be adequately nourished with the common household food available, provided he or she is given enough of it.

The aim of the book is to provide a practical background of knowledge to all those concerned with health and nutrition. It will explain why preventive treatment and improvement in the health and feeding of infants, young children and their mothers is necessary, and how this may be done. It is therefore addressed to medical doctors, nurses, auxiliary nurses, midwives, multipurpose health workers, dietitians, home economists, mukhya-



sevikas and those responsible for training village level workers such as gramsevikas, balsevikas and anganwadi workers. It is hoped that the information provided will be interpreted in a practical way at each level until it reaches all those working directly with mothers in a rural or urban setting.

While the book concentrates on the nutritional needs of mothers and children and on how these can be met, chapters are also included on related health matters, including health and nutrition education. The tone is deliberately didactic, but a selective bibliography is appended for those who wish more detailed or supportive information, and some useful reference material is provided in a series of annexures.



## MATERNAL NUTRITION

### In Pregnancy

Since the mother has to nurture the foetus, her nutrition has a direct relationship to birth weight, and an important but not so obvious effect on foetal stores of iron and fat soluble vitamins A and D. Yet maternal nutrition is very difficult to define and assess. Several surveys have shown that most mothers are under-weight (weighing less than 50 kg), and have a calorie deficit of 500-600 calories a day. Many mothers of poor communities continue to do hard physical work throughout pregnancy and it is estimated that they would need on an average about 300 extra calories a day during the last trimester of pregnancy. They would also need to be fed more often, i.e. 3-4 times a day. (Recommended Dietary Intakes for Indians, *Indian Council of Medical Research*, 1981).

In many parts of India there are taboos and prejudices regarding the diet of the pregnant woman. In some cultures, a positive effort is made to keep the weight gain low and thus—it is thought—to facilitate delivery. Many animal foods and eggs are forbidden. But the main cause of malnutrition in the mother is insufficient intake of food and unequal distribution of food within the family. Most mothers feed their husbands and children and other family members first and then eat whatever is left over. This is usually inadequate in quantity and quality, and leads to inadequate stores in the foetus of iron, vitamin A and thiamine. Vitamin A in mother's milk also may be low. If the baby is born prematurely, his iron stores will be lower still.

Anaemia is common, and about 50 per cent of women have a haemoglobin level of less than 10g per cent during the third trimester. Anaemia is mainly due to iron deficiency but there may be folic acid deficiency also. (*ICMR Bulletin*, Vol. 4, No. 6, June 1974).

Thirty to forty per cent of women show evidence of vitamin B deficiency. Diets of pregnant and nursing mothers are frequently grossly deficient in protective foods like milk, pulses, leafy vegetables and even in the staple cereals. The diets are deficient in calories, proteins and several nutrients, as is shown in the following tables.



This deficiency can be made good by eating more of the same food.

The weight gain during pregnancy is much less than that found in the developed countries. Most women belonging to the lower socio-economic group gain around 3 to 5 kg as against 10 kg in the developed countries. Of the 10 kg weight gain, about half is contributed by the weight of the foetus, placenta and amniotic fluid and the other half by the deposition of fat and other nutrients. These provide a store which can be used during lactation. The Indian women of low socio-economic group do not have this fat store, and so their body tissues are depleted during lactation. (Ghosh, S., *Project No. 01-658-2. A longitudinal study of the outcome and survival of a birth cohort*).

---

**Daily Dietary Intake of Pregnant Women of Low Income Groups**

	Actual	Recommended
Calories (kcal)	1400	2500
Protein (g)	40	55
Iron (mg)	18	40
Calcium (mg)	260	1000
Vitamin A (ug)	304	750

---

(Source: *ICMR Bulletin*, Vol. 4, No. 6, June 1974 and Recommended Dietary Intake for Indians, *ICMR*, 1981).

Even though the foetus can be thought of as a parasite on the mother which takes from the mother what it needs, it still seems to suffer from the effects of maternal malnutrition as can be seen from the low birth weight. In most parts of India, the mean birth weight is between 2700 and 2900 g. Babies born in better socio-economic homes weigh 200 to 300 g more than those in the poorer homes. About 25 to 30 per cent of babies weigh less than 2500 g at birth even though more than half of them are born at term. These, like the pre-term babies (born before 37 weeks of gestation), are handicapped in several ways that frequently result in perinatal\* and neonatal\*\* deaths (see foot-note and also refer to Chapter 7). Those that survive remain small throughout childhood and never seem to catch up with the normal babies. However, their intellectual development, according to the data available, seems to be normal. (*ICMR Bulletin*, Vol. 5, No. 2, February 1975).

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\*Perinatal deaths include still-births and deaths within the first week after birth.

\*\*Neonatal deaths include live-born babies deaths within four weeks after birth. It does not include still-births.



**In Lactation**

Dietary intakes of lactating mothers belonging to the poor income groups are far below those recommended (see table below). Direct evidence of the amount of milk these women can produce is difficult to get, but the indirect evidence of its insufficiency is in the form of inadequate weight gain of the baby after fourth to fifth month. The wonder, however, is that they can produce even as much milk as they do. Many mothers can produce 400 ml of milk a day during the period 6 months to a year and 100-150 ml during the second year.

The quality of milk is also affected in severe maternal malnutrition and the concentration of fat and vitamins A, B and C is lower than in well fed women. The concentration of iron and calcium, however, seems normal.

Daily Dietary Intake of Lactating Mothers of Low Income Groups		
	Actual	Recommended
Calories (kcal)	1860	2900
Protein (g)	40	65
Iron (mg)	18	30
Calcium (mg)	300	1000
Vitamin A (ug)	304	1150

(Source: *ICMR Bulletin*, Vol. 4, No. 6, June 1974 and Recommended Dietary Intake for Indians, *ICMR* 1981).

The lactating woman not only needs food for her own requirements, but also to compensate for the loss of energy through providing breast milk for her baby. A healthy mother can not only provide more abundant milk for her baby, but can take much better care of her baby because she is fit.

**Foetal growth**

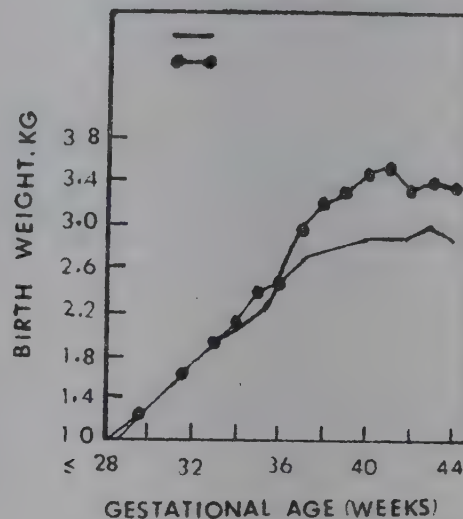
Intrauterine growth of the foetus has been studied by calculating the gestation period from the date of the last menstrual period (LMP) and weighing the baby at birth. About 60 to 70 per cent of simple, uneducated women can recall the date of their LMP with the help of the local festival calendar\*. All health workers should be familiar with the Indian calendar and carry the previous year's calendar with them as well as the

\* See Annexure 7. Indigenous Calendar for mothers and child clinics.



current one. A baby, who is underweight at birth, may either be preterm or may not have grown adequately in the mother's womb. Such babies need special care regarding their feeds because they do not suck the breast milk and get easily tired. The mother will have to persevere, and feed small quantities of breast milk every 1-2 hours. They should also be protected from extremes of heat and cold. The environment should be as clean as possible because of the high risk of infection in these babies.

Indian Study →  
Usher et al →



#### 1-1 Intrauterine growth—Comparison of Indian and Western study (Ghosh et al, Paediatrics 47, 826; 1971)

It has been found that the growth of the foetus is comparable to western standards until 34 to 35 weeks of pregnancy, and then tends to slow down. The birth weight of the baby tends to be greater when the mother is given a food supplement during the last 3 months of pregnancy. The mortality in the neonatal period is directly related to the birth weight and gestational age; the lighter or more immature the baby, the higher the death rate. To ensure the best foetal growth, it is important to supervise the pregnancy. This includes preventing and treating infectious diseases, or high blood pressure and advising better nutrition. The family must also be made to understand why the mother needs to reduce her work load and have sufficient rest before delivery. An increase in the birth weight would lower the perinatal and neonatal mortality.

#### Conclusion

High priority should be given to providing expectant and nursing mothers with adequate medical care and good nutrition. Low birth weight and immaturity can be traced at least in part to poor maternal nutrition. Repeated pregnancies further cause malnutrition and anaemia in the mother, again pre-disposing to low birth weight, which results in a higher death rate. □



ASSESSMENT OF GROWTH, NUTRITIOUS STATUS  
AND DEVELOPMENT  
IN INFANCY AND CHILDHOOD

Pattern of growth

In the normal, adequately nourished child, rapid growth takes place during the first year of life. In different parts of India the average birth weight is about 2700 to 2900g. Babies born in better socio-economic houses weigh more than those belonging to a poor socio-economic group. Almost all babies lose weight during the first 3 to 4 days after birth and regain it by 7 to 10 days. After that, the weight increases by 25 to 30g a day for the first 3 months, and thereafter less rapidly (see table below). The widely accepted formula that a baby doubles its birth weight at 5 months and trebles it at 1 year is by and large true except in low birth weight babies, who double their weight earlier, and may be four times their birth weight at 1 year. It is important to be familiar with the weight gain pattern as shown in the table.

Average Weight and Height Increments during the First Five Years	
Age	Weight increments per week
0—3 months	200 g
4—6 months	150 g
7—9 months	100 g
9—12 months	50-75 g
Age	Weight increments per year
1—2 years	2.5 kg
3—5 years	2.0 kg
Age	Length increments per year
1st year	25 cm
2nd year	12 cm
3rd year	9 cm
4th year	7 cm
5th year	6 cm



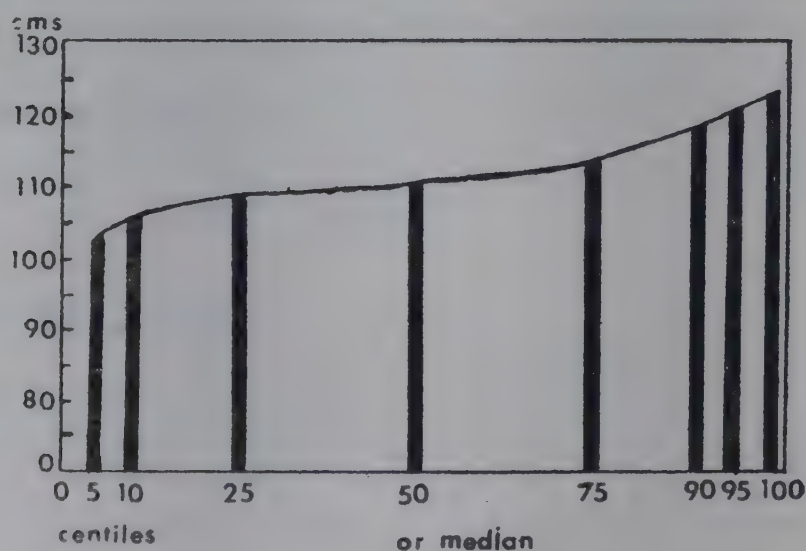
The length of a baby at birth is 48 to 50 cm and at 1 year of age becomes one and a half times as great. Thereafter it increases as shown in the table on page 5. The values in the table are averages and each child will differ from another to a certain extent, but as long as the trend of growth curve is maintained there is no cause for concern.

Several Indian studies have shown that the weight curves of many children are excellent for the first 4 to 5 months, with the birth weight doubling by this age, but after this the curves tend to flatten. This is because by this time the breast milk becomes less, and no or insufficient food is given to supplement the breast milk. Many well nourished mothers, however, can produce enough breast milk to sustain baby's growth for about 6 months on breast milk alone.

### Assessment of malnutrition

It has to be remembered that a series of readings is more important than a single reading. Any weight taken has to be compared with some reference standard, and that of the National Centre of Health Statistics (NCHS), USA is considered suitable. The concept of centiles should be understood before growth can be evaluated and compared with a reference standard. It is easier to understand in relation to height. If 100 children of the same age are lined up from the tallest to the shortest, the 50th will be in the middle and will represent the median or 50th percentile. The tenth from the left will represent the 10th percentile (90 children will be taller than him) and the 90th from the left, the 90th percentile (only 10 children will be taller than him). The lower the percentile, the more growth retardation there is likely to be.

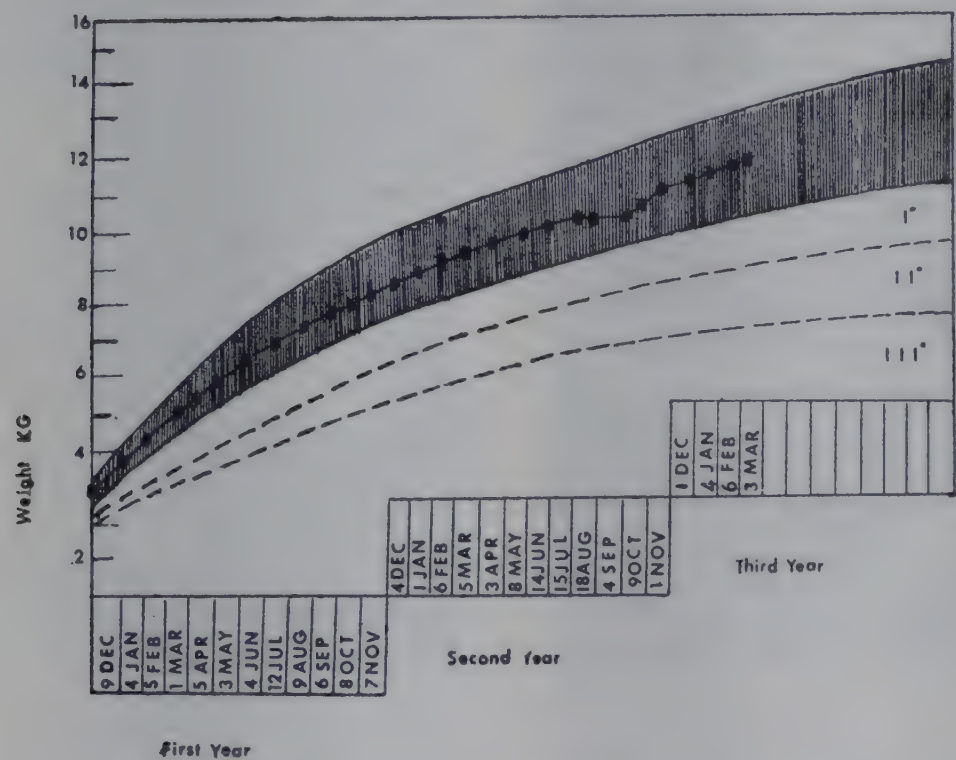
The same criteria can be applied to weight, and this, too, can be represented as percentile curves.



2-1 The Concept of Centiles for height (100 boys aged 5 years)



It is preferable that the reference standard for comparison should be from the same population, care being taken to ensure that these children do not suffer from nutritional constraints or suffer from infections. This, at the present time, can only be found in the higher socio-economic group children. The anthropometric measurements of high socio-economic group children from Delhi are given in Annexure 2, Tables 4,5,6, and 7. Data is also available from some other parts of India but till such time as there is agreement on their use, it is better to use the NCHS standards. Besides, the measurements of well nourished children from different countries do not differ much.



2-2 The normal growth pattern

The weight can be recorded on a card such as the one illustrated. This type of card with some variations is used in different parts of India.

The top line represents the 50th percentile of the NCHS standard and the lower lines represent 80 %, 70 % and 60 % of that weight. The grading of nutrition is done as follows:

Down to 80 % (shaded areas) is considered satisfactory.

- I Between 80 % and 71 %—first degree malnutrition.
- II Between 70 % and 61 %—second degree malnutrition.
- III Under 60 %—third degree malnutrition.

The danger signs are when a growth line either does not follow the curve and remains straight, or worse still, actually shows a downward trend.



## Measurement of growth

### *Weight*



2-3 Recording the weight with a beam type scale. This work does not have to be done by a nurse or a doctor.



2-4 Salter spring scale can be used for children from 0-6 years.

All measurement techniques should be standardised and instruments must be checked frequently. In a clinic, a beam type weighing scale should be used because it is more accurate. For field conditions, a portable beam type of machine is difficult to get. A Salter spring machine is quite satisfactory. The baby is slung in strong pants and the straps are fixed on the hook of the machine or a hammock like seat can be made. The machine can be hung from a hook or a nail on the door, or an attendant can hold it up. This machine will weigh up to 20 kg and is accurate to 100 g; its accuracy should be tested frequently. The present bathroom type of scale is very unreliable for children and should not be used.

In children up to 2 years, height, or rather length, is best measured by the infantometer with the child lying supine. The head touches the headboard, and knees are held extended. The second board touches the



## Height



2-5 Measuring the length with an infantometer, knees are held extended and head against the headboard.

feet. The length is read off from the measurements marked on the infantometer. In older children, who can stand, height can be measured by the rod attached to the lever type machine or by an *anthropometer*, or more simply without expensive tools in the following way.



The child should stand with bare feet on a flat floor against a wall with feet parallel and with heels, buttocks, shoulders and back of the head touching the wall. The head should be held comfortably erect and a mark made on the wall with the help of a right-angled object (e.g., large book) touching the top of the head horizontally, with its vertical edge flat against the wall. Height is then measured by using a good steel measuring tape. The tailor's tape is not very accurate.

2-6 Measuring the height against the wall.

## Weight for height

A child may have a low height for the age because he is thin or because he is stunted due to past malnutrition or a combination of both. The best way to identify these children is to compare their weights with the table

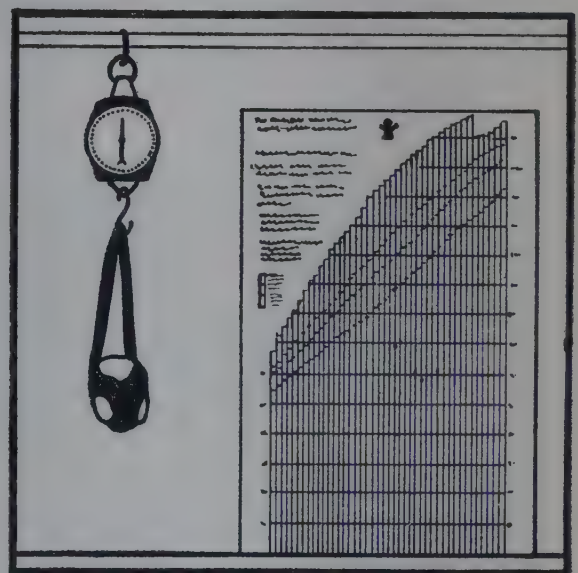


in Appendix-1 and see whether or not the weight is in the normal range (i.e. above 80 per cent) for a child of similar height.

### *The thinness chart*

While weight for height is a well known and an age-independent method of assessing the nutritional status of a child, so far it has not been used much in the Community. Now, the weight/height ratio has been translated in the form of a graphic chart called 'The Thinness Chart' by Save the Children Fund showing the grades of malnutrition in different colours. It makes it easy for a health worker to use the weight for height method for assessing growth and the nutritional status.

2-7 Put the chart near your scale. The chart goes on the wall. The wall must be even. The bottom of the chart must touch the ground.

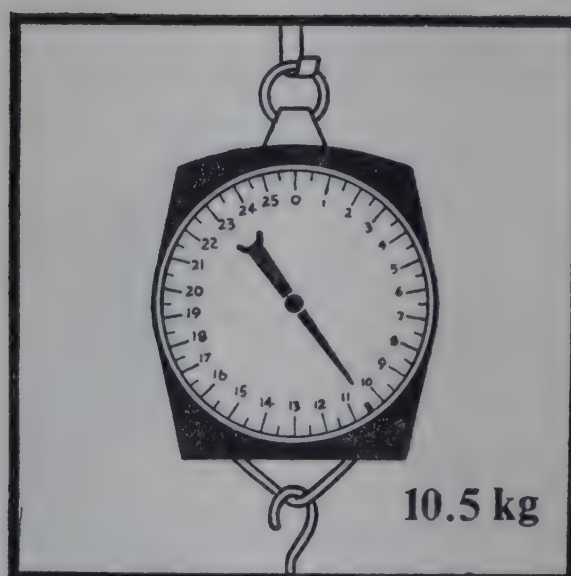


2-8 Weigh the child.

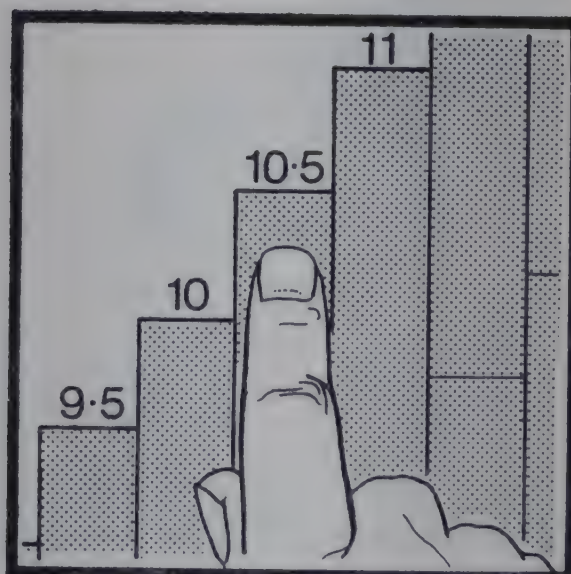




2-9 Note the weight to the nearest half Kilo (Kg).



2-10 Find the weight on the chart with your finger.



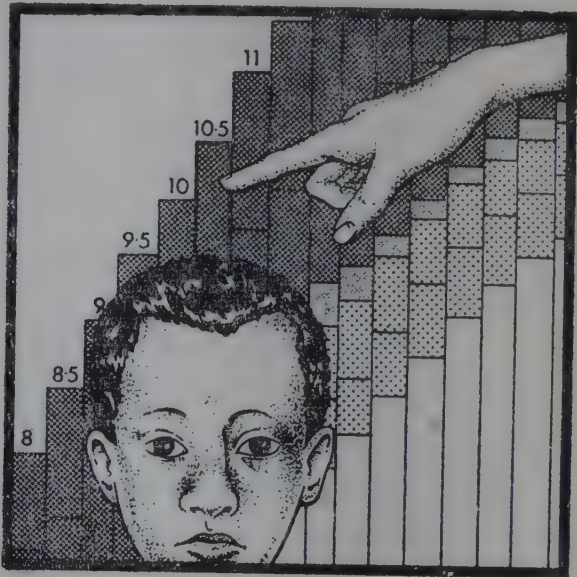
2-11 Ask the mother to put her child under your finger. The child must be in the correct place.





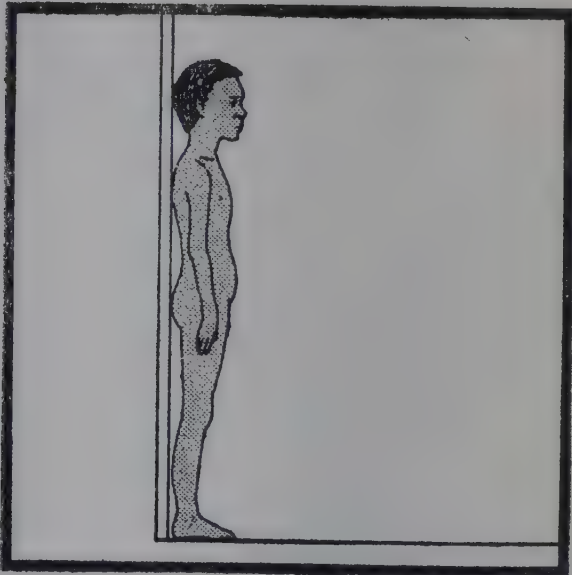
*Check that:*

2-12 a. the middle of the child's head is under his weight on the chart.



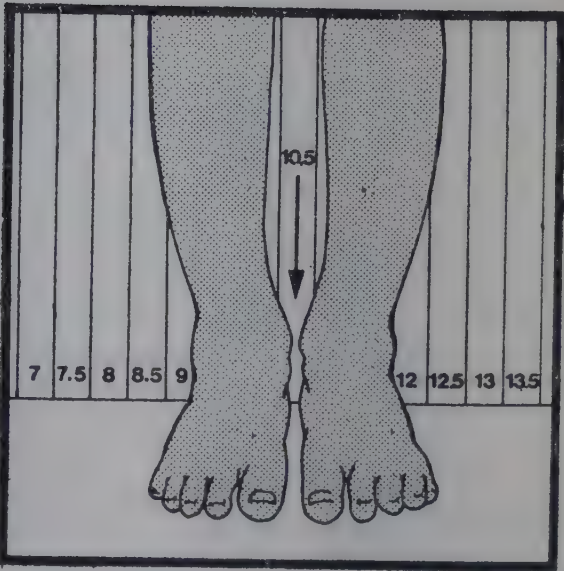
*Check that :*

2-13 b. the child's shoulder and feet are against the chart.



*Check that:*

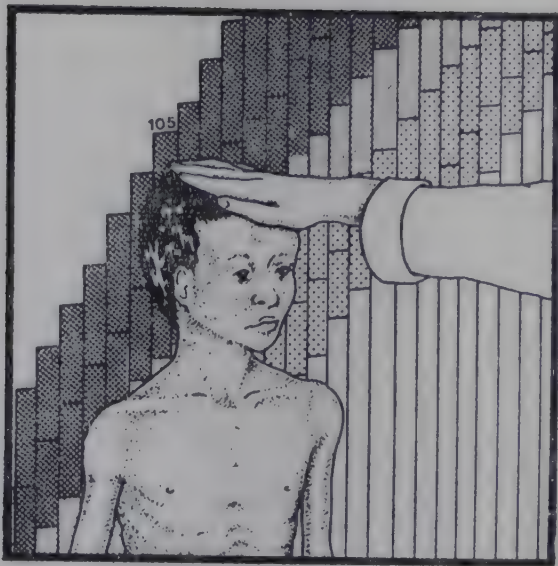
2-14 c. the child's heels are against his weight at the bottom of the chart.





*Then:*

2-15 Put the palm of your hand on the child's head. Touch the chart with your finger. Note the colour that is touched by your finger.



*Is the child in the:*

2.16 UPPER RED?

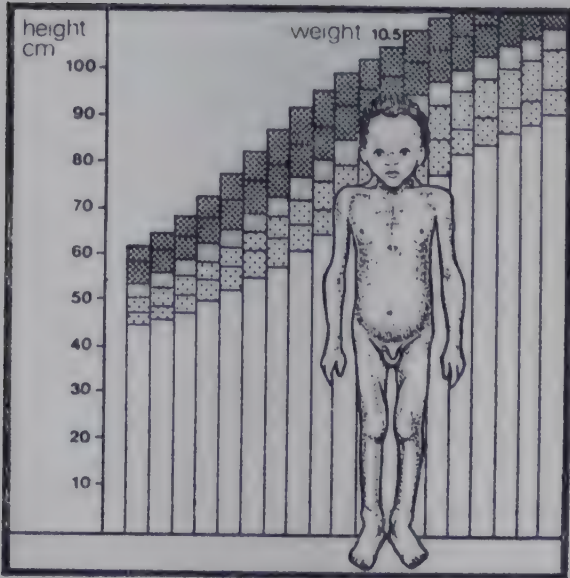
LOWER RED?

YELLOW?

GREEN?

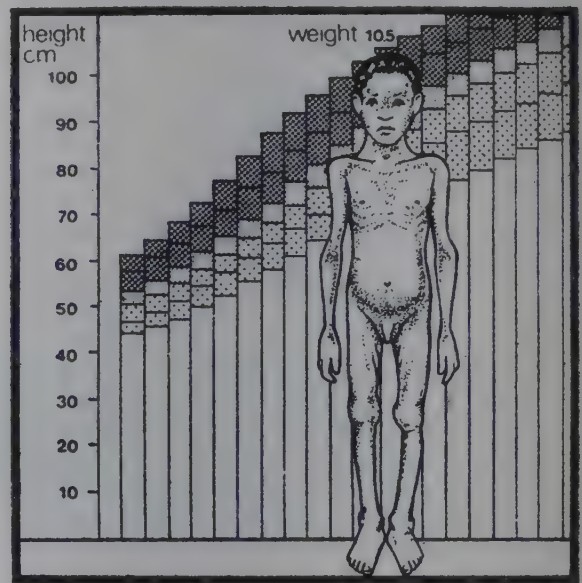


2-17 This child is in the UPPER RED. He is extremely thin (wasted). You must help him urgently.

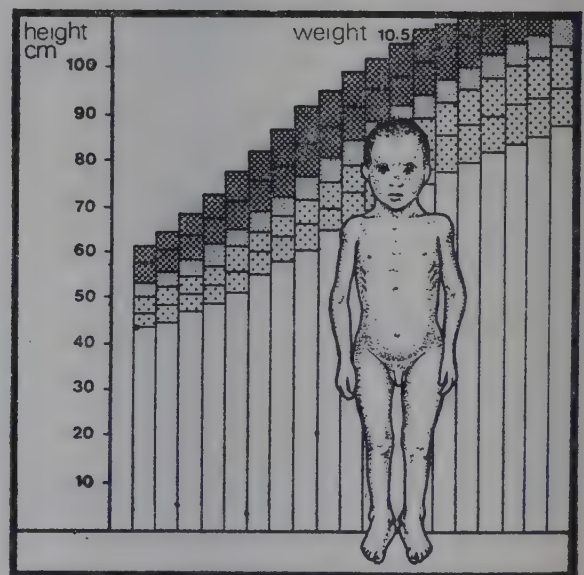




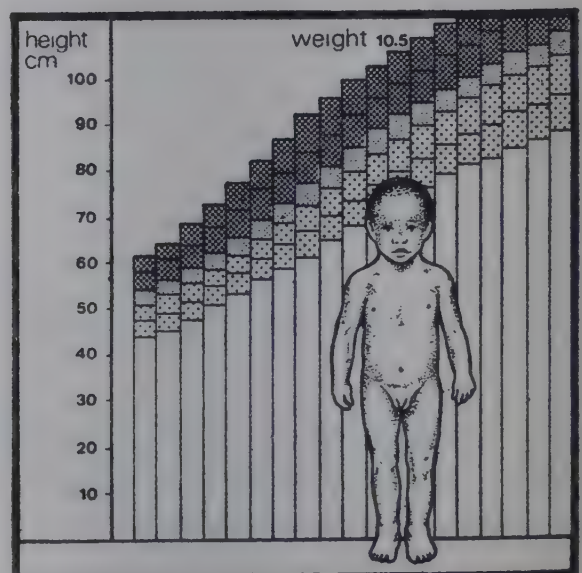
2-18 This child is in the **LOWER RED**. He is very thin (wasted). You should help him quickly.



2-19 This child is in the **YELLOW**. He is thin. You must watch him regularly.



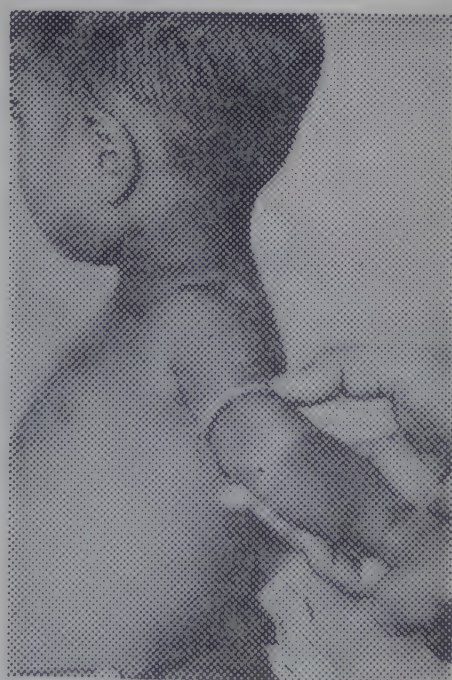
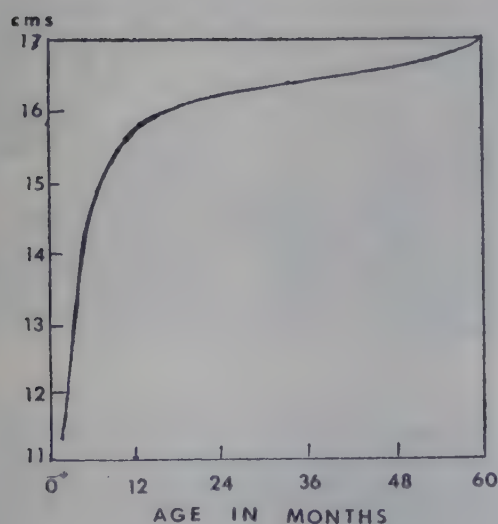
2-20 This child is in the **GREEN**. He is well nourished.





### Mid-arm circumference

This is an easy and useful measurement. The middle of the upper arm is measured while it is hanging relaxed at the side of the body. Normally, the arm circumference increases rapidly from birth to 1 year from about 11 to 16 cm. Between the 1st and 5th birthdays, it remains fairly constant at about 16 to 17 cm in well-nourished children and can be used as an age-independent method. During this time, the fat of early infancy gets replaced by muscle. A measurement below 80 per cent of normal, i.e. 12.5 cm indicates severe malnutrition and between 12.5 cm and 13.5 cm indicates moderate malnutrition. Health workers can use tapes with green, yellow and red colours indicating normal, moderate malnutrition and severe malnutrition respectively (see the tape and its colours on the next page.) This is a useful method for illiterate workers but should be mainly used as a screening procedure for severe malnutrition. For a quick nutrition survey, a bangle with an internal diameter of 4.0 cm can be used. If it goes over the child's upper arm, the child is severely malnourished. (Laugesen, M., *Indian Pediatrics*, 12, 1261; 1975; Ghosh, S., Man Mohan and Yayathi, T., *Indian Pediatrics*, 13 : 915, 1976).



2-21 Mid-arm circumference from birth to five years. It remains more or less constant between 1 and 5 years.

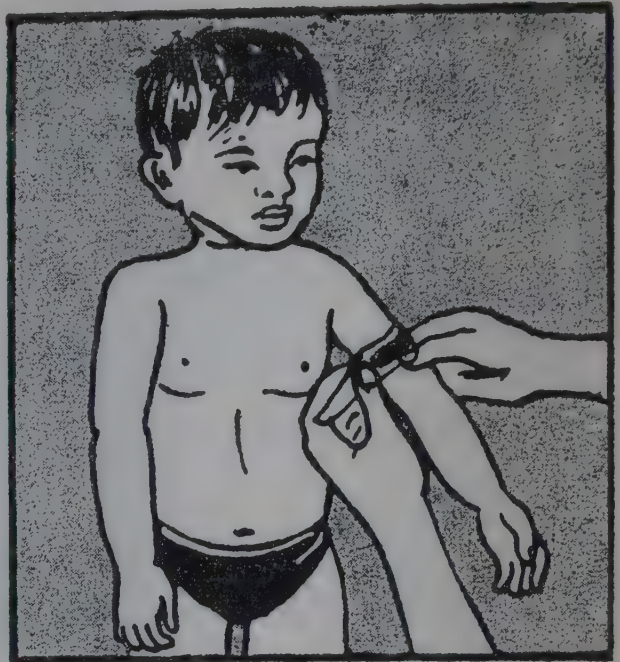
2-22 Measuring the arm circumference with a bangle.

There are many other methods; those interested should consult the manuals listed in the bibliography. Most have only a research interest. It is best to stick to a few methods so that workers become familiar with them and mistakes are not made. It should be remembered that however sophisticated the machine, ultimately the results depend on the care and accuracy with which a measurement is taken.



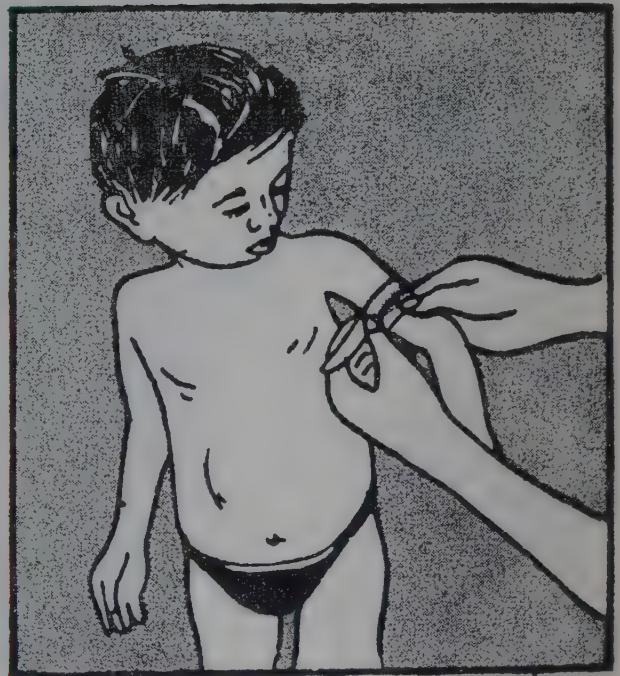
*2-23 This is a healthy Child*

If the red end of the strip comes opposite the green, the child is getting enough food. Keep feeding him enough food. If he becomes sick, give him soft food till he is better.



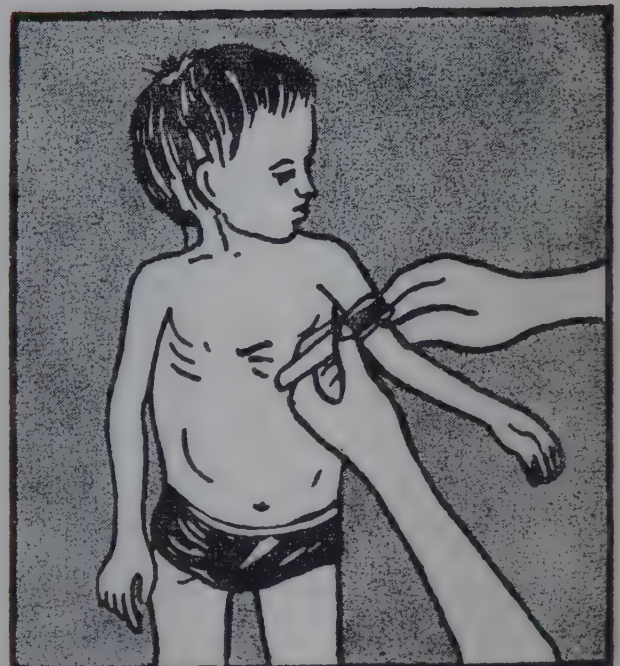
*2-24 This Child needs care*

If the red end of the strip comes opposite the yellow, the child needs more food every day. Feed him with soft food.



*2-25 This is Child in danger*

If the red end of the strip comes in red itself, the child needs more food. If he does not get enough food, he may die. Feed him five or six times a day. If he has not started to eat soft food, **START** now. Feed him with more food.





## Development

It is important for a health worker not only to know the growth pattern of the child but also to know whether the child is developing normally or not. For this it is necessary for the health worker to be familiar with some of the important milestones of development.

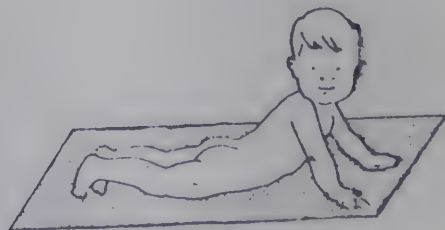
### Taking notice and smiling

A newborn baby does not fix his eyes on any object. His eyes wander. By about one month of age he seems to look at his mother as if to recognize her. At about 1-1/2 to 2 months of age, the baby smiles in recognition.



### Hearing

A newborn baby can hear and is startled by a loud sound. By one month the eyes and head turn towards the source of sound. By 3-4 months the baby is excited by the sound of footsteps or approaching voice.



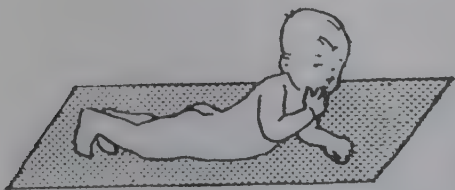
### Head control

A newborn baby cannot support his head and so when the baby is picked up, his head has to be supported. By 4-6 weeks, the head control begins and gradually becomes more and more developed, till between 3 and 4 months of age the baby can hold his head up and does not need any support for his head.



### Rolling over

Once the head control is good, the baby tries to roll over, first from his stomach to his back and later from his back to his stomach. Between 4-5 months, the baby becomes adept in rolling over.



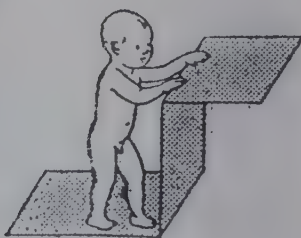
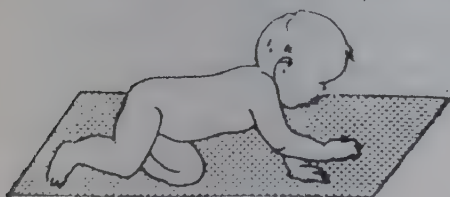
### Sitting up

Between 5 and 6 months, the baby can sit if supported with pillows or cushions. By 6-8 months the baby can sit unsupported.

### Crawling, Standing, Walking

By 8-9 months, the baby has more control over his legs and back and begins to creep or crawl. Some babies move around very fast on their buttocks, giving themselves a push with their legs. Others crawl using both arms and legs and can move around very fast.

Soon the baby learns to stand holding on to a bed or holding someone's hand and gradually begins to walk. By 12-18 months most babies can walk without a support. Soon afterwards the baby learns to climb stairs. By 2 years, a child can run.





### Holding objects

Newborn babies have a grasp reflex. As soon as anything is put into the palm, the baby takes firm grip of it. Around 3-4 months he begins to hold objects deliberately. He puts out his hand and tries to hold the objects. At this stage the baby uses his palm and four fingers and not the thumb. By 8-9 months, he begins to make use of his thumb and fingers and can hold small objects like peas, beads, string etc. He makes efforts to feed himself.

### Development of speech

Speech has its beginnings in the cooing and gurgling of the baby from the third month onwards. By 6 months the child is making all sorts of noises and begins to make sounds like na-na, pa-pa etc. Gradually the number of words which the child can say increases and by 1-1/2 to 2 years, the child can speak fairly well.

This is the general pattern development of a child. Some children achieve the milestones earlier than others, but as long as they do it within the time range given, their development is considered normal, and there is nothing to worry.

If a baby does not fix his gaze or look at an object by two months of age, he should be examined by a doctor to exclude blindness or mental retardation. If a child is not startled by a sound, or does not look towards where the sound is coming from, he should be examined to exclude deafness. Deafness is also the cause of a child not talking, because unless he hears, he cannot talk.

The motor milestones like sitting, standing and walking, can be delayed in a malnourished child. In low birth weight babies also, some of the milestones may be delayed.

In case of any doubt, the health worker should ask the mother whether the child's development is the same as the older child, or whether she feels it is slower.

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#### Outline of major milestones

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Milestones	Age of achievement
Taking notice and smiling	1-2 months
Head control	3-4 months
Rolling over	4-5 months
Sitting	6-8 months
Walking	12-18 months
Speaking simple sentences	18-24 months

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## NUTRITIONAL NEEDS OF CHILDREN

Adequate food is the most important requisite for growth. While it is important throughout childhood, it is more crucial during the first 5 years of life (particularly the first three years) when rapid growth is occurring and the child is entirely dependent on his mother for food. Insufficient food will not only result in undernutrition in terms of inadequate weight gain, but will also hinder growth. Because of insufficient energy intake body proteins are used for energy. In the presence of infections, the breakdown of proteins is accelerated.

Health workers should have a basic knowledge about the energy requirements at different ages as well as about the foods that are good sources of nutrients such as iron and vitamin A.

### Calories

Calories are a measure of energy. Energy is required for growth and activity. The energy value of foods is usually measured in calories or, more strictly, in kilo-calories (kcl). However, recently a replacement of this unit of energy with 'joule' has been adopted by the International Union of Nutrition Scientists. One Kcl is equal to 4.184 K Joule.

A baby needs 120 calories per kg of bodyweight per day. On an average, a baby of 1 to 2 years needs 1000 calories daily. This is about half of what the mother eats. This, to many people, sounds incredible but is none the less true; and unless health workers are convinced of it, they cannot forcefully and persistently give this message to the community.

The bulk of the ordinary Indian diet presents a problem. (See *chapter 8—Processing of food*). An adult can consume four times the food as compared to a child of two years, though his needs are only double that of the child. Unless the mother is advised to feed the child at frequent intervals, the child may remain underfed because he cannot consume the quantity needed at one or two meals. The food should contain more solid and little water so that the bulk is reduced. (See also 'Fats' below).

After the age of one year an approximation to the child's energy needs can be made by adding 100 calories for every year of his life, e.g., a child of 5 years needs 1400 calories daily.



## Protein

Protein is required for the growth and maintenance of the body. If sufficient calories are not taken, proteins are diverted for the supply of energy.

Proteins are essential constituents of all plant and animal cells. Protein molecules are made up of different combinations of over 20 simpler units called amino acids, but only 9 of these are essential i.e. they cannot be manufactured by the body and have to be present in the food eaten. The protein value of a particular food is determined partly by its amino acid composition. The proteins of whole egg and human milk are considered the best, in this respect, among food proteins, and the pattern of essential amino acids in these foods is usually taken as a standard for comparison with other foods.

The proteins of animal foods compare well with egg protein and hence such foods are considered to be sources of good quality protein. The proteins in foods of plant origin are not so well balanced. In comparison with egg protein, the cereal proteins are poor in lysine, one of the essential amino acids, while pulse proteins are poor in methionine, another of these, though they are rich in lysine. A judicious mixture of vegetable proteins can therefore produce a well-balanced result; one can make up the deficiency of the other.

### *Animal proteins*

These are derived from fish, eggs, meat and milk and its products. In coastal areas fish is eaten, and some poor families breed pigs and can eat the meat relatively cheaply. However, the consumption of such foods is generally low because of their expense, and even most non-vegetarian families eat little meat and that, too, infrequently. Such foods are certainly not essential to good nutrition.

### *Vegetable proteins*

Legumes such as beans, peas and grams and all the dals are a rich source and contain 20 to 25 per cent of protein. Cereals also contain protein, the content varying from 7 per cent in rice to about 12 per cent in wheat. The rest fall in between. Oilseeds, too, are a good source and, because of their oil content, are rich in calories as well. Meals obtained after extraction of oil from groundnuts, gingelly and cottonseed contain as much as 50 per cent protein. Cereals and pulses when eaten together are better than either eaten separately. It is no accident, perhaps, that the traditional Indian meal pattern has evolved precisely this mixture.

### Requirements

Protein requirements can be calculated either according to the body weight or as a percentage of the energy (calorie) need. If weight is taken for calculation, then the expected weight for that age should be used and not the actual weight which may be much below the expected. Eight to ten per cent of the calories should be given as proteins. This is adequate for children of all ages.

The Indian Council of Medical Research (1981) has recommended the following daily energy and protein requirements for different ages in childhood:

Energy and Protein Requirements for Children-Birth to 6 Years

Age group	Body Weight	Energy	Protein
	(Kg.)	(Kcal per Kg)	(Grams per Kg)
0 to 6 months	3.3 - 7.8	118	2.0*
6 to 12 months	8 - 10	108	1.7*
			(Daily Protein)
1 to 3 years	12	1220	22**
4 to 6 years	18.8	1720	29**

\*In terms of milk protein alone.

\*\*In terms of mixed vegetable protein of NPU 65 relative to egg.

From the preceding table it is seen that an infant aged 6 months to 1 year requires about 13-17 g of protein and 800-1000 calories daily. By this age the mother's breast milk is reduced and probably supplies only about 5 g of protein and 300 calories. Additional food in the form of semi-solids and solids must supply the rest of the requirements.

If the energy intake is inadequate, some protein will be used for energy purposes and so the protein available for tissue building will be reduced. Infections and parasites also affect the protein requirement considerably. The relationship between nutrition and infection is complex, but in fever the protein value of the diet is reduced probably because the energy requirements increase and proteins are utilised for energy.

Several diet surveys have shown that there is a gross deficiency of calories and many nutrients in the diets of pre-school children.



The following table shows a comparison between actual and recommended consumption:

Diet of pre-school children	Actual intake	Recommended intake
Cereals (g)	147	150 — 200
Pulses (g)	16	40 — 50
Leafy vegetables (g)	4	50 — 75
Other vegetables (g)	14	30 — 50
Fruits (g)	7	40 — 50
Milk and milk products (g)	80	200
Fats and oils (g)	4	20 — 25
Flesh foods (g)	4	30
Sugar and jaggery (g)	5	30 — 40
Calories (Kcal)	758	1200 — 1700
Protein (g)	19	22 — 29
Iron (mg)	6.9	20.25
Calcium (mg)	193	400 — 500
Vitamin A (ug)	220	250 — 350
Riboflavin (mg)		0.7 — 1.0

(Source : Nutrition Expert Group of *ICMR*, 1968 and Indian Council of Medical Research, 1981).

The above table emphasises the fact that while there is a deficiency of every category of food, the protein intake is sufficient. It is the total intake of food that has to be emphasised rather than the protein. The diets of children of a higher socio-economic group have an excess of protein.

### Fats

These are derived from animal or plant sources and supply 9 calories per g compared to 4 calories per g supplied by protein or carbohydrate. Animal fats are found in fatty parts of animal, liver, egg yolk and fat in milk. Vegetable sources are coconut, nuts, sesame, mustard, sunflower and cottonseeds. Fats are expensive and hence eaten in small quantities. In India, only 13 per cent of calories of the average total diet are derived from fats, while in developed countries they provide 30 to 40 per cent. They are the vehicles for supplying the fat soluble vitamins and they also supply the essential fatty acids. But their most important characteristic is their concentrated energy, so that their use can reduce the bulk of the diet which, as stated above, is a common reason for undernutrition in young children.

## Minerals

The most important are calcium and iron.

### *Calcium*

This mineral is required for the formation of bones and teeth, and so children need relatively more than adults.

Sources : The best are human and animal milks and the bones of small fish. Millet and Ragi are good sources. Ragi is specially valued for its calcium content of about 344 mg per 100 g. Leafy vegetables like amarnath (cholai), fenugreek (methi) and drumstick leaves are also rich sources. (See Annexure-3, Table—3).

### *Iron*

This is needed to make haemoglobin, the oxygen-carrying pigment of the red blood cells. An inadequate intake of this mineral leads to iron deficiency anaemia. There is considerable loss of iron due to haemorrhage during menstruation and during labour. Iron requirements of women are double during the reproductive period as compared to the post menopause period or compared to a man.

About 10 per cent of the iron in an average Indian diet is normally absorbed. More is absorbed during deficiency states. The requirement is higher during periods of rapid growth and during pregnancy. An intake of 20 to 30 mg a day is adequate for older children and adults. The requirement in infancy is 1 mg per kg of weight. Some animal protein foods like meat, and especially liver, are excellent sources of iron that is easily absorbed. Iron is not well absorbed from plant foods such as green vegetables, cereals and legumes. The iron in breast milk is absorbed very efficiently.

Sources : Dried fish, meat, liver, eggs are good sources. Green vegetables and cereals are medium sources. Wheat, soyabean and bengal gram are richer than bajra, ragi and parboiled rice. Milk is a poor source. (See Annexure—3, Table—4).

## Vitamins

These are essential for the maintenance of good health. Their lack sometimes leads to a specific deficiency disease (see Chapter 11). Well-off people often take more than they need, which does not do them any extra good. Poor people often do not get enough. Only the ones of which deficiencies are most common will be considered.



### *Vitamin A (Retinol)*

Vitamin A is needed for the normal function of the eyes including the ability to see in the dark. It keeps the skin and other body surfaces healthy and it is needed for normal bone development. Deficiency of vitamin A is associated with increased infections and protein-energy malnutrition. Deficiency leads to loss of vision, and eventually to blindness. Vitamin A is present in the fatty parts of several animal foods. The liver oils of certain fish like cod, halibut and shark are very rich in vitamin A. Many vegetables are also a source of vitamin A because they contain a substance called carotene which is converted into vitamin A in the body. About 50 g of the common fresh leafy vegetables a day will provide an adequate quantity of this vitamin. Fresh vegetables contain more carotene than do stale ones. Cooking losses of vitamin A are small but frying destroys 70 per cent of it. On an average there is a 50 per cent loss in storing and cooking as practised in Indian homes. Young children require about 300 ug retinol per day. Vitamin A can be stored in the liver. Therefore the body can build up a store which can be used if some times there is lack of vitamin A in the diet.

Sources : Animal foods—milk and milk products, butter, ghee, eggs, liver etc. Vegetable foods—green leafy vegetables such as spinach, amaranath leaves, mint, radish leaves, curry leaves, coriander, drumstick leaves, and other vegetables like carrots, and ripe fruits like mangoes, papaya and orange. (See Annexure-3, Table—1).

### *Riboflavin*

The daily requirement is 0.55 mg per 1000 calories. The average loss in cooking is around 30 per cent.

Sources : Milk and milk products, eggs, liver and leafy vegetables; wheat, millets, and pulses also contain some. (See Annexure-3, Table—2).

### *Folic Acid*

Folic acid is involved in the multiplication and maturation of red blood cells, and its deficiency results in certain types of anaemia. The intake is low in rice eating population.

Daily requirements are 100 ug.

Sources : Fresh green vegetables, liver and pulses are good sources. Cereals contain 5 to 12 ug per 100 g and pulses contain 23 to 70 ug per 100 g. Leafy vegetables contain 50 ug per 100 g.

### *Vitamin B<sub>12</sub>*

Like folic acid, vitamin B<sub>12</sub> is also involved in maturation of cells and a deficiency results in certain types of anaemia.

Sources : Animal foods like milk, meat and liver are good sources. Vegetable foods do not contain B<sub>12</sub>, but the vitamin is provided by moulds and yeasts often associated with plant foods.

### *Vitamin C*

Vitamin C is very susceptible to destruction by exposure to light and heat and to drying. The daily requirements are about 50 mg allowing for 50 per cent losses in cooking.

Sources : Fresh fruits and vegetables are good sources. Guava is particularly rich. Other rich sources are citrus fruits. Amla is the richest source, but is rather astringent and not easily acceptable to children. Vitamin C in amla is not destroyed by heat because of its acidity. Dry pulses do not contain vitamin C but germinating pulses are rich sources. About 85 per cent of the vitamin is formed in the grain and 15 per cent in the sprout. The best source of vitamin C for the infant is breast milk.

Storage of leafy vegetables at room temperature destroys about 35 per cent of the vitamin and refrigeration destroys about 12 per cent.

### *Vitamin D*

Vitamin D plays an important role in the absorption of calcium from the intestine and in the formation of the bones.

Sources : Fish liver oil is the richest natural source. It is also found in liver, egg yolk and milk but only to a small extent. However, vitamin D is formed in the body by the action of sunlight on certain chemicals in the skin. This can be a sufficient source, so it is important that children are allowed to play about in the sun. An infant too should be exposed to the sun and should not be over clothed while doing so. □



## BREAST FEEDING

The practice of breast feeding is almost universal in India except among the so-called educated women and the high socio-economic group. However, the increasing use of the bottle by the urban slum dwellers has disastrous results for the baby, because their knowledge regarding feeding, environmental sanitation and hygiene is poor.

The reasons for shifting from breast to bottle are usually trivial and unsound primarily due to the lack of knowledge and commitment by the health personnel. Only too often has the breast feeding been stopped because of trivial things like a child crying or vomiting occasionally (attributed to colic or indigestibility of milk) or the normal frequent soft stools of the baby (considered to be diarrhoea) etc. It is ironic that breast feeding is often more successful where there are no doctors or other health workers. It seems that health workers need education regarding breast feeding rather than mothers in rural areas. For the mothers, this is a natural method of feeding because they see others around them doing the same. They do not even consider any alternative to breast feeding. We have to take care, however, that this practice is not eroded in any way by newer socio-cultural developments.

“*Breast is best*” is absolutely true. Milk is well adapted to the special needs of each species and human milk is ideally suited to the needs of the human infant. It is well to remember that various kinds of infant milk powders and tins were not even known a hundred years ago, and yet the babies continued to thrive. Promotion of breast milk substitutes by the milk manufacturing companies have contributed considerably to a decline in breast feeding.

The World Health Organization, UNICEF and many other organizations have for many years emphasized the importance of breast feeding and of reviving the practice where it was in decline. After many meetings and discussions, the International Code of Marketing of Breast milk Substitutes was developed and gradually many countries have developed their own national code. In India, the code was approved by Parliament and was gazetted in December 1983. Together with this, a great deal of effort is being made by government and by several agencies to make suitable information available to the people. (*A Summary of the Indian National Code for Protection & Promotion of Breast Feeding is given on pages 36 & 37*).

### Reasons for discontinuing breast milk

The usual causes for giving the bottle to the baby are:

1. Death of the mother at, or soon after birth.
2. Illness in the mother or baby.
3. Next pregnancy—some mothers stop breast feeding in the belief that the milk is harmful to the baby. This is a wrong belief and breast feeding should be continued.
4. The mother who has to go out to work.
5. Mother gets upset when the baby cries and she starts a bottle in the belief that either her milk is not enough or does not “suit” the baby.
6. Low birth weight baby who finds it easier to suck from a bottle rather than the breast.
7. Lack of confidence in breast feeding particularly when it is the first baby.
8. A mother who does not want to spend any time on breast feeding and hands over the bottle feeding to someone else in the family.
9. The effect of advertisements regarding tinned milk producing fat, and healthy babies.
10. Doctors’ or other health workers’ advice based on lack of interest and poor knowledge.

### Encouraging breast feeding

The advice regarding breast feeding should start ideally in the prenatal period. The advantages of breast feeding should be emphasized. We must make sure that the nipples are not retracted. Gently pulling them out frequently helps. The breasts should be kept clean and the secretion which is there during the last few weeks of pregnancy should not be allowed to dry on the nipples otherwise they will crack and the feeding will be painful. Advice regarding the ease, simplicity and advantages of breast feeding should start during pregnancy.

1. It is the simplest way to feed the baby. Warm, bacteria free milk is available all the time, and the mother need not worry about how much milk the baby needs as long as the baby is happy and is gaining weight.

2. Breast milk costs nothing. This is not quite true if one takes account of the cost of extra food the lactating mother requires, but it is certainly cheaper than substitutes. It is estimated that cost of artificial feeding may be as much as one third of the family income.



3. It is easily digestible and the fats are better emulsified. There is a higher proportion of lactalbumin which is better digested than casein.

4. It has a lower protein and mineral content which is more suitable for the baby especially the premature babies.

5. It confers passive immunity on the baby. The early milk-colostrum, is especially rich in antibodies and protects the baby from neonatal infections.

6. It hinders the growth of *E. coli* in the gut because of the iron-binding protein, lactoferrin and the bifidus factor which promotes the growth of lactobacilli and inhibits the growth of *E. coli*. Breast milk contains live cells and lysozyme, which protect against infections. It also contains an antiviral substance Interferon.

7. It contains water soluble vitamin D besides the fat soluble fraction, which protects against rickets. It also contains more vitamin A, C and E than cow's milk. Iron in breast milk is better absorbed than cow's milk.

8. Breast fed infants are less likely to get colic, infantile allergies and eczema than those bottle fed.

9. The mother has a feeling of satisfaction and achievement and psychologically it makes her and her child happier.

10. She hugs and cuddles her baby several times a day while feeding and gets to know her baby better.

11. This is, in turn, conducive to better lactation. Very often the breasts will start dripping with milk when the mother holds the baby.

12. Breast feeding increases the period of lactation amenorrhoea and infertility after delivery and helps to increase spacing between one child and the next.

### Physiology of breast feeding

The breast consists of the nipple surrounded by the areola, connective tissue, fat and milk ducts. The amount of fat and connective tissue determine the size of the breast. During pregnancy the breasts enlarge to 2-3 times their normal size and new small ducts and buds are formed. The milk is later secreted from their lining cells.

The production of milk is controlled by two reflexes :

1. *Milk production reflex.* As the baby suckles the breast, a hormone called prolactin is produced which causes the cells in the alveoli to produce milk.
2. *The let-down reflex.* Another hormone called oxytocin is produced as a result of suckling by the baby. Oxytocin makes the muscle cells around the alveoli contract and the milk is pushed down towards the nipple.

The let down reflex seems to be sensitive to rather small emotional and psychological disturbances. Anxiety can inhibit it, while quiet confidence can enhance it. The same is even true for other mammals; if cows or buffaloes are frightened, roughly handled, or there is a change in the hands that milk the animals, they will not “let down” to yield milk. In other words, it is important to see that the nursing mother is comfortable, relaxed and unworried.

### Brain

#### 1. Hypophysis at Base of Brain

Hormones are released from here into blood and thus sent to breast.

#### 2. Prolactin Reflex

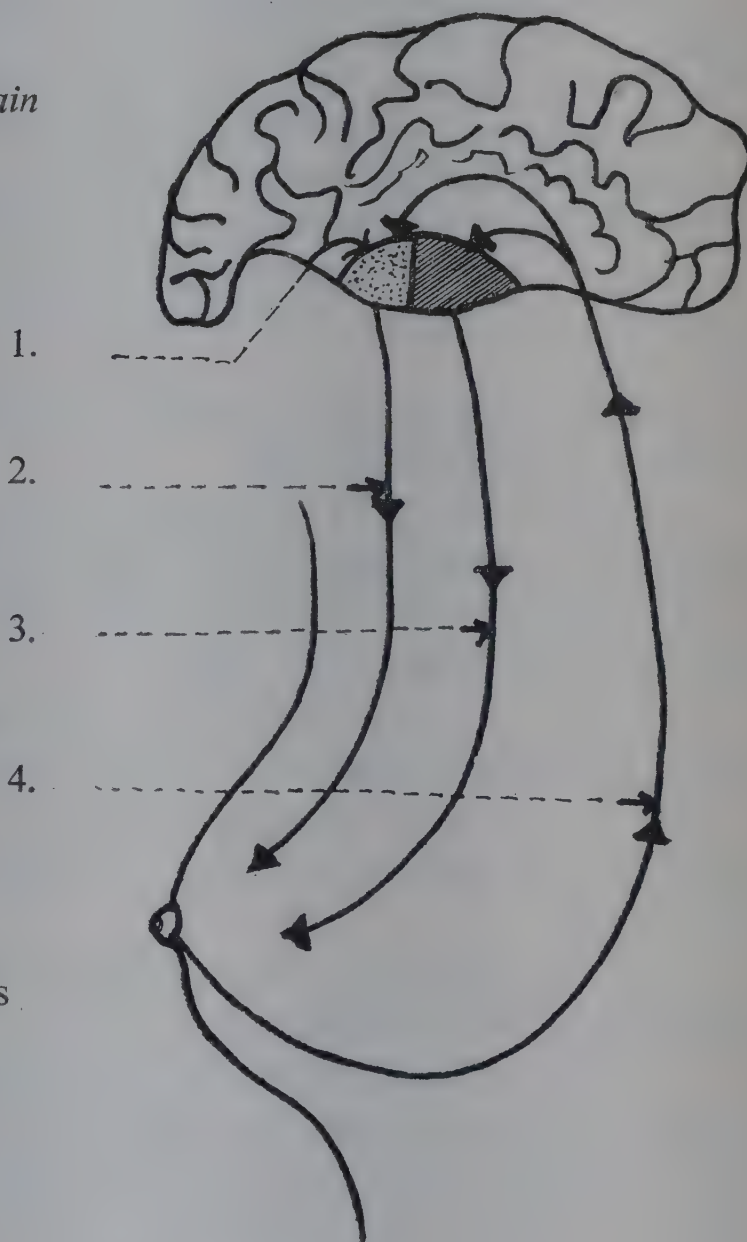
increases milk production (Hormone, prolactin).

#### 3. Let-down Reflex

Pushes milk towards the nipple (Hormone, oxytocin).

#### 4. Sucking Reflex

Sends impulses to hypophysis by the vagus nerves.



### Volume of the breast milk

After the birth of the baby, the milk supply increases rapidly. From about 100 ml on the second day, it rapidly increases to about 500 ml in the second week. During the first 5-6 months, healthy infants consume



600-800 ml per 24 hours but there are wide variations between babies. In poorly nourished mothers the quantity of milk secreted is less than this.

Almost every category of food has been believed by some to be a galactagogue, i.e. a food that helps to produce more milk. On the other hand, the foods avoided by the mother after delivery include, in different regions, rice, dal, eggs, root and leafy vegetables, brinjals, onions, sour foods, fish, meat, mustard oil, etc. It is difficult to say what basis there is to these beliefs and prejudices, but innumerable women eating all these foods do not seem to suffer from ill effects. No particular food has been definitely known to increase the quantity of milk. What is important is that the mother should eat an adequate amount of diet rather than worry too much about any particular food.

### Starting breast feeds

As soon after birth as feasible the mother should put the baby to her breast. There will only be a little yellowish colostrum, but it is very rich in proteins and antibodies which protect the baby from neonatal infections. Many mothers, however, do not put the baby to the breast for one or two days in the belief that colostrum is bad, and instead keep giving water sweetened with sugar, glucose or jaggery. Often it is a herbal mixture called ghutti or janam ghutti. This practice should be discouraged because, firstly, the baby gets no nourishment during the first two days, and secondly, due to the baby not sucking the breast, the stimulus to milk production is delayed and this interferes with milk production. There is also the danger of aspirating the fluid into the air passages and lungs, because it is given with a spoon often with the child asleep or crying. This can be dangerous and may even result in death. The fluid may also produce infection if it is prepared in an unhygienic way. To satisfy the cultural belief, a drop or two of the fluid may be put into the baby's mouth carefully, making sure that it is clean and not likely to produce infection.

Mature milk starts from the third or fourth day and the quantity also increases and the breasts tend to get engorged and tense. This, however, gets relieved with the baby sucking vigorously.

From the third day onwards the quantity of milk increases. The baby should be put to the breast 5 to 6 times a day, depending on his hunger and should be fed from both breasts. The baby should be fed at night also, whenever he is hungry. Some mothers are afraid that if they get the baby used to taking a feed at night he will always demand it, disturbing their sleep, and so they try and "train" him not to demand a feed at night. The result is that the baby remains hungry, and, cries himself to sleep,



and the mother also is upset because the baby is crying. Often both the mother and the baby are crying and yet the breast feed is being denied to the baby. This attitude is wrong. Just as we need food when we are hungry, so does the baby. Soon after birth, he does not know the difference between night and day and cries whenever hungry. In a few weeks' time he learns to sleep for longer hours, and can usually sleep through the night, and automatically gets out of the habit of waking up at night. It is much simpler and more logical to feed him when he wants it, rather than when the mother or the clock dictates. If the milk is adequate the baby will gradually make a 3 to 4 hourly schedule for himself. This is the self-demand schedule, and is nothing new. It has been the traditional method of breastfeeding everywhere. Even though most rural mothers feed their babies in this way, the point is stressed because not everyone recognises the value of these traditions, and practices are beginning to change, very much for the worse.

The duration of feeding is another problem that needs to be explained to the mother. The baby sucks all he needs in about five minutes from each breast, but he enjoys sucking and so can be allowed to suck a little longer. A feeding time of 15 to 20 minutes is usually enough, unless the baby is underweight and his sucking is poor.

### **Position of the mother and the baby**

Too much fuss has been made in the past about the position of the mother and baby during feeding. Babies are fed differently in different cultures, but in India a vast majority, particularly at night, prefer to feed the baby lying down. Often both the mother and the baby go off to sleep after the feed. After the first few weeks, the sitting position is preferred, the baby lying on the mother's lap and her elbow supporting the head. Once the baby learns to sit, he very often feeds while sitting in the mother's lap or on the floor or ground next to her. In all these positions, the baby can be fed satisfactorily provided he has easy access to the breast and the mother is relaxed and not in a hurry. The less inhibitions a mother has about the place and environment of feeding, the more successful is the breast feeding. To simple women in towns and villages, breast feeding is a natural phenomenon and they do not feel any need of privacy while feeding the baby. As a matter of fact, since the whole community looks upon it as a natural method of feeding, it does not attract any attention at all, and the simple women can be seen feeding their babies everywhere—in the midst of crowds, markets and fairs. Inhibitions come with a better social and economic level and the problems of breast feeding also increase. But more and more educated women are today breast feeding their babies and taking pride in it.



A breast-fed baby swallows very little air while feeding and does not usually need burping. If, however, there is a tendency to vomit, burping should be advised. The baby is held against the shoulder, and he brings up wind in a few minutes. He may bring up a mouthful of milk also with wind, but this does not matter. Some babies, on the other hand, are habitual posetters, i.e. they go on bringing up a little bit of milk every now and then, often soiling their own and their mother's clothes. Usually the weight gain is excellent. It seems that these babies, due to sheer greed, take more than what is good for them or they need. This should be explained to the mother, so that she does not worry. Once they start taking semi-solids, this habit stops.

Oral pills that may be used for family planning may interfere with milk secretion. It is better to advise some other form of contraception for the first few months after the baby is born.

### **Bowel pattern in breast milk fed babies**

On breast milk, the baby passes yellowish, sticky, semi-solid stools. They may be slightly curdy or greenish at times. The number varies a great deal but most babies pass 6 to 7 stools a day, usually after feeds. They pass a little bit of stool every time they pass some wind. This is often mistaken for diarrhoea, and all manner of drugs are given, but it is a perfectly normal pattern, and needs no treatment. On the other hand, some babies may be considered to have constipation because they pass stool every second day even though it is perfectly normal in consistency. This, too, needs no treatment.

A happy, satisfied baby who sleeps a good deal during the day and sleeps well at night, has normal stools and appears to be growing, is obviously getting enough food from the breast. However, for any objective assessment, one must be familiar with the growth pattern of infants and children. The simplest parameter is the weight, and this can be recorded in any clinic or health centre. The recording of height needs more experience and takes more time, even though it has the advantage of not changing due to temporary problems, like diarrhoea or any other short illness, when the baby may lose some weight. It should be remembered that one reading is not enough for assessment. A series of readings over some time, and the trend of the weight curve, is more important than just one weight recorded. A convenient method of recording the weight is on an under-5 card which, with minor variations, is used in many parts of India (*see page 8*). The advantages of an under-5 clinic for a better child health delivery system will be discussed later (*see Chapter 14*).

Comparison of some nutrients in various milks, 100 g

Milk or product	Calories (kcal)	Protein (g)	Fat (g)	Carbohydrate (g)	Calcium (mg)
Human milk	71	1.2	3.8	7.0	33
Cow's milk	69	3.3	3.7	4.8	125
Sheep's milk	108	5.6	7.5	4.4	200
Buffalo's milk	102	3.8	7.5	4.9	200
Goat's milk	71	3.3	4.5	4.4	130
Dried skimmed milk	357	36.0	1.0	51.0	1260
Dried whole milk	500	25.5	27.5	37.5	900

Comparison of some nutrients in various milks/100 cal.

Milk or product	Quantity	Protein (g)	Fat (g)	Carbohydrate (g)	Calcium (mg)
Human milk	140ml	1.7	5.4	10.0	50
Cow's milk	145ml	4.8	5.4	7.0	181
Sheep's milk	93ml	5.3	7.1	4.3	190
Buffalo's milk	98ml	3.8	7.4	4.9	190
Goat's milk	140ml	4.6	6.3	6.2	183
Dried skimmed milk	28g	10.0	0.3	14.3	353
Dried whole milk	20g	5.1	5.5	7.5	180

### Some problems associated with breast feeding

#### *Cracked and painful nipples*

Milk must be expressed by hand for a day or two while the nipple is allowed to heal. Treating the nipple with any edible oil, wetting the nipple with breast milk, or squeezing a few drops of orange or lemon juice on the cracks, all encourage healing. Make sure that the baby is biting the areola while sucking, and not the nipple.



**Breast milk congestion**

The breasts should never be allowed to become engorged. If the milk is in excess of what the baby needs, the excess should be manually expressed by pressing the areola with the thumb and index finger, repeatedly. The nipple should not be squeezed as it becomes inflamed and sore. For the same reason, a breast pump should not be used because it causes oedema of the nipple and that predisposes it to infection. In successful breast feeding, there is hardly any problem with engorgement.

**Breast feeding for working mothers**

There is a provision for maternity leave in all government and industrial establishments. Recently the rule has been modified, so that the whole leave (12 weeks) can be taken from the time of delivery, rather than 6 weeks before and 6 weeks after delivery, as was the case earlier. If mother can take extra leave without jeopardising her job, she should be encouraged to do so. Unfortunately the provision for maternity leave does not exist in small enterprises and several other sectors.

While not at work, the mother should breast feed her baby as often as possible both during the day and night. If possible, she should feed the baby just before going out for work, which would avoid the need for expressing her milk, keeping it as cool as possible, preferably in a refrigerator in hot weather, and the problem of contamination. However, if the baby is not hungry and does not seem to want a feed, then she should express the milk and leave it for the baby to be fed by someone else in her absence. Great care would have to be taken regarding hygiene; otherwise the baby will develop diarrhoea.

**Illness in the mother**

Minor illnesses such as colds, mild viral infections and fever should not prevent a mother from continuing to breast feed her child. This will not hamper her recovery from the illness provided she is adequately fed. On the other hand the tedious business of cleaning and sterilizing bottles may delay recovery. The appetite is reduced during an illness, and this may reduce the volume of breast milk, but if the baby continues to suckle, the volume of milk will again increase when the mother is recovering. Mother will need encouragement and support from the health personnel.

Mothers who are receiving medicines can continue to breast feed. Most drugs are excreted in milk in very small quantities and do not harm the baby in any way. However, it is advisable not to give chloramphenicol, tetracycline, metronidazole, diazepam and barbiturates to the mother while she is breast feeding. All unnecessary drugs should be avoided.

A mother with tuberculosis too can continue to breast feed her baby. In all probability the baby is already infected because of the close contact with the mother. The mother should be given antitubercular treatment, and the baby should be given isoniazid under the advice of a doctor. In a poor home with hardly any facilities for artificial feeding, premature weaning and separation from the mother is a far greater risk to a baby than is continuing to feed from her.

### **Summary of the Indian National Code for Protection and Promotion of Breast-Feeding**

#### *Aim*

The aim of this Code is to contribute to the provision of safe and adequate nutrition for infants, by the protection and promotion of breast-feeding, and by ensuring the proper use of breast-milk substitutes, when these are necessary, on the basis of adequate information and through appropriate marketing and distribution.

#### *Scope*

The Code applies to the marketing, and practices related thereto, of the following products; breast-milk substitutes, including infant formula; other milk products, foods and beverages, including bottled complementary foods, when marketed or otherwise represented to be suitable, with or without modification, for use of a partial or total replacement of breastmilk; feeding bottles and teats. It also applies to their quality and availability, and to information concerning their use.

### **The Major Provisions of the Code Include**

#### *No direct promotion to the public :*

There shall be no advertising or other form of promotion to the general public of products within the scope of this Code. There should be no point-of-sale advertising, giving of samples, or any other promotion device to induce sales directly to the consumer at the retail level, such as special displays, discount coupons, premiums, special sales, lossleaders and tie-in-sales, for products within the scope of this Code. (Article 5.1 and 5.3).

#### *No promotion of products in health care facilities :*

No facility of a health care system should be used for the purpose of promoting infant formula or other products within the scope of this Code. Facilities of health care systems should not be used for the display of products within the scope of this Code, for placards or posters concerning such products, or for the distribution of material provided by a manufacturer or distributor other than that specified in Article 4.3. (Article 6.2. & 6.3)



*No free samples or other gifts to mothers :*

Manufacturers and distributors should not provide, directly or indirectly, to anybody, samples of products within the scope of this Code, nor any gifts of articles or utensils which may promote the use of breast-milk substitutes or bottle-feeding. (Article 5.2, 5.4).

*No contact with mothers by company sales personnel :*

Marketing personnel, in their business capacity, should not seek direct or indirect contact of any kind with pregnant women or with mothers of infants and young children. The use by the health care system of "professional service representatives", "mothercraft nurses" or similar personnel, provided or paid for by manufacturers or distributors, should not be permitted. (Article 5.5 and 6.4).

*No promotional samples or gifts to health workers :*

No financial or material inducements to promote products within the scope of this Code should be offered by manufacturers or distributors to health workers or members of their families, nor should these be accepted by health workers or members of their families. (Article 7.3).

*No promotion to health workers : and the provision of clear and consistent information :*

Information provided by manufacturers and distributors to health professionals regarding products within the scope of this Code should be restricted to scientific and factual matters and such information should not imply or create a belief that bottle-feeding is equivalent or superior to breast-feeding. It should include clear information on all the following points:-

- (a) the benefits and superiority of breast-feeding;
- (b) maternal nutrition, and the preparation for the maintenance of breast-feeding;
- (c) the negative effect on breast-feeding of introducing partial bottle-feeding;
- (d) the difficulty of reversing the decision not to breast-feed; and
- (e) where needed, the proper use of infant formula, whether manufactured industrially or home-prepared. □



## ADDITION OF SEMI-SOLID AND SOLID FOOD

Breast feeding should be continued as long as possible. However, after 4-6 months, most mothers will not have enough milk for this to be the sole source of food for the baby, and so some other food will have to be started in addition. There are some cultural beliefs in different parts of India regarding the suitable time for starting semi-solid food. Most communities have a religious ceremony—*Annaprashana*—between the 6th and 9th month of age. This, however, is limited to the middle class urban population and is not usually practised by the poor rural population.

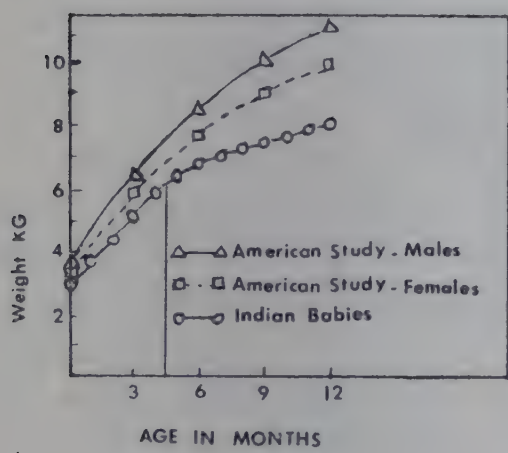


5.1 Breast feeding has, fortunately for the child, remained fashionable for thousands of years in India.

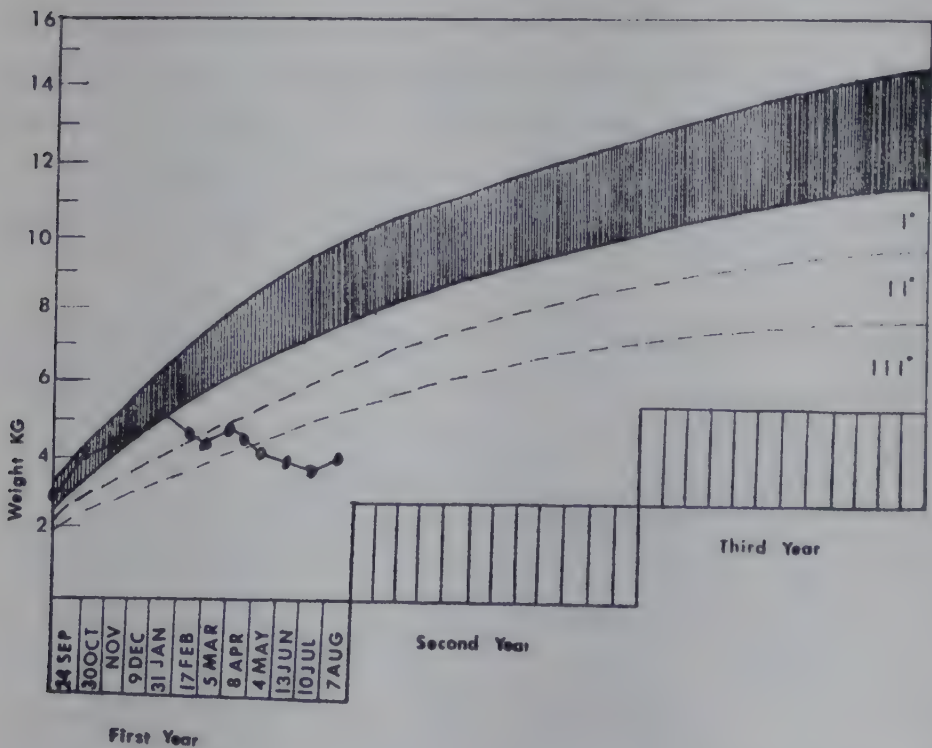
Because of poor knowledge on the part of the mother regarding nutritional requirements of the baby, the period between 6 months and 2 years



is one of perpetual hunger. The breast milk has become much reduced and the mother does not know what, how much, and when, other foods should be given. Often she gives several semi-solids or the top water of solids, but the quantity of each is meagre and does not add appreciably to the total calorie intake. If solid foods are not introduced at the right time, the child may become marasmic and it is then often difficult to get him to take them. The breast should never be allowed to become a mere pacifier. Only too often does one see a marasmic baby hanging on to the empty breast and seeming to be content. Not being used to any other type of food, he rejects all efforts to feed him.



5.2 Inadequate weight gain in Indian babies after 4-5 months in comparison with the American babies, because of the delayed introduction of semi-solids.



5.3 Failure of growth due to failure of breast feeding and failure to add semi-solids.

The commonest cause of a baby not gaining weight on breast feeds is inadequate quantity of breast milk. He will cry, suck his fingers and will have constipation. If, in spite of looking into every possible reason for inadequate breast milk and encouraging the mother, there is no improvement, then the baby will have to be given some animal milk in addition to the breast (see Chapter 6).

### **Knowledge of weaning foods and practices**

While low income plays a vital role in undernutrition, ignorance about nutrition is equally, if not more, important. Studies in several countries including India have shown that more than half of all cases of malnutrition are to be found in households where there is no absolute shortage of food. The reason why available food is not given to the child is that the mother does not know how much food the child needs or that her child is becoming malnourished. In many cases it is difficult to feed the child because of depressed appetite due to some infection. Most mothers do not understand the importance of weaning foods. From a purely milk diet, the infant is supposed to go on to thick roti and the other household diet. The baby nibbles at it, and spits it out. Here two things are important: first, what foods to be given at what age, and second, the quantity to be given. While advising diet it is important to keep the economic state of the family and the availability of different foods in mind. If you advise foods that the mother cannot afford, she will lose all confidence in you. One should be familiar with the seasonal availability of different foods and their prices and the exact method of cooking them. Certain fears and prejudices of the mother (or the grandmother) should be allayed. The mother often wonders how the child will eat when he has no teeth. Instead of brushing the query away one should explain that if the food is soft and mashed, the baby has no need of teeth for eating it.

The beliefs in “cold” and “hot” foods should not be condemned outright. There are innumerable alternatives that can be given and are equally nutritious. The belief that cereals are bad for the liver can also be overcome with tact and patience. Banana is believed to produce cough and phlegm, and oranges are believed to be bad when baby has a cold. Mangoes are “hot” foods, but they become “cool” when soaked in water for some time. All these beliefs can be overcome with patience and alternatives may be suggested. No one food is a “must” for a child. A convenient mixture can be picked up from the variety of foods available. Food cooked in oil is as good for the baby as for the grown ups. This, too, has to be explained to the mother. Many mothers do not freely talk about these problems, but they may not give a particular food to the baby



because they think it is not suitable. The most important quality of a health worker is to establish such a relationship with the community that the mothers feel free to discuss their problems with him or her. The health worker may have to open their eyes, too, to problems they may not have recognised.

The grandmother has to be won over if weaning is to succeed. The young mother will not carry out advice if the grandmother has different views. So the health worker has to educate the grand mother and indeed the whole family as well as the mother.

Most parts of India have a warm climate most of the year and so the food does not keep for long. Hence all food should be freshly and hygienically cooked. All the utensils should be clean, and the hands should be washed before cooking and feeding. It is customary to clean the utensils with mud or ash. Mud can cause infection but ash, if taken from the oven or kept in a clean place, is a good cleansing agent. Food should be kept covered and protected from dust and flies. It has to be remembered that the resources and time of a family are limited, and so the simplest recipes, should be advised, rather than complicated recipes which are time consuming and costly. It is preferable to feed the child from the family food by taking out the child's portion before adding spices, and after softening and mashing it.

Fortunately in this country we have a diet pattern based on a mixture of cereals and pulses, like idli and dosa in the south, and khichri and missi roti (mixture of wheat and gram flour) in the north. As a matter of fact, the words dal-chawal and dal-roti are used as one word, indicating that these things are meant to be eaten together. This enhances their food value.

Food should be served to the child in a separate plate or bowl, rather than out of someone else's plate, so that the mother has a fairly good idea of the quantity the child has eaten. It encourages the child to learn to feed himself also.

One or two teaspoons should be given initially and without hurry so that the child gets accustomed to a different taste and consistency. Initially a baby very often spits out the food. This does not mean that he does not like it. Learning to swallow semi-solid food is difficult for a baby who only knows to suck the breast. Husks, bean skins and vegetable fibres may cause indigestion, so everything must be thoroughly mashed in the beginning. Force should not be used. Feeding should be a pleasant experience. Mothers have been seen to put one leg across the child's abdomen and the other across his neck and then shove food down his throat



every time he opens his mouth. Besides being unpleasant, this can be dangerous, because the food can be aspirated into the lungs.

Food should not have chillies or spices and should be comfortably warm or cool—neither too hot nor too cold. The child should set the pace and not the mother. If a particular food is refused it should not be offered for a few days, but should be replaced by some other food. Remember, there are dozens of foods to choose from and just as the grown-ups have their likes and dislikes, a baby is also entitled to his preferences. Some babies prefer sweet things while others like salty things, but be careful with the salt and do not encourage a “sweet tooth”. The food items should be changed frequently as the child gets bored with eating the same thing. Arguments, force feeding, frightening and beating only lead to food problems later on.

Fruits such as mosumbis, apples, grapes and seedless pomegranate (bedana anar) are considered to be good for health and mothers will give these in preference to banana, mango or other energy giving foods. While grapes and apples are cheaper where they grow, they are extremely expensive in other places and the mother should be dissuaded from wasting money on them. The best source of vitamin C is mother's milk, but if for some reason that is not available, then some other source of vitamin C such as fruit juice will have to be given, taking particular care about cleanliness. In poorer houses, it is more practicable to give vitamin C in the form of vitamin drops than risk infection by giving fruit juice.

### Weaning

Most mothers can produce sufficient breast milk to sustain adequate growth only for the first 4-6 months. By this time the baby weighs about 6 kg and requires about 600 kcal for his growth. The aim should be to start adding semi-solids to the diet at this time so that the balance of the energy is supplied by the semi-solids.

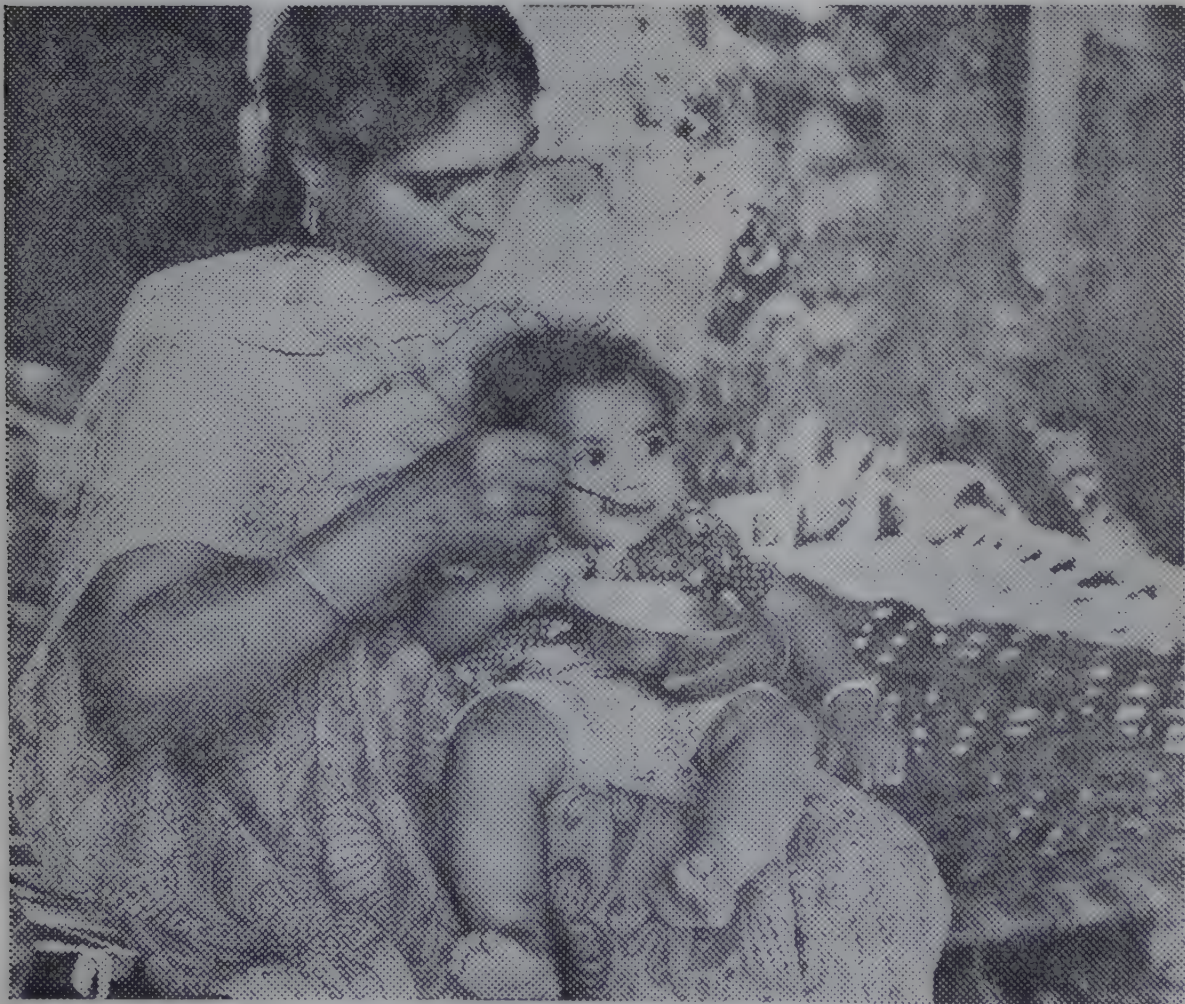
Should the semi-solids be given before or after breast feeds? While it is true that a hungry baby will suck the breast vigorously, thus stimulating the prolaction and the let down reflex and helping milk production, it is also true that some babies do not take the semi-solid once the hunger is partly satisfied. Each baby is different and if the baby takes the semi-solid happily after the breast feed, this method should be preferred.

Some mothers of course can produce adequate quantity of breast milk for a longer period. If the baby is continuing to grow normally on breast milk alone, the introduction of semi-solids can be deferred till a later age, but in no case later than 6-7 months.



**What foods to give ?****4-6 Months**

Start with a mashed fruit like banana, or a cereal like suji. If suji is not available, a porridge can be made with atta, ground rice, ragi, millet etc. Mix a little oil or ghee in the porridge. Give 1 to 2 teaspoons to begin with, and gradually increase over the next 3 to 4 weeks, so that by that time the baby is taking 50 to 60 g of porridge (half a cup) or one whole banana. Other fruits in season like papaya, chickoo, mango, etc., can be given in a similar way. Apples can be given after stewing them. In the hills, apricots and pears are a good weaning food. About 50 g can be given eventually, increasing the amount gradually. Sago is a pure starch food and hence it is not very suitable. Several pre-cooked baby foods which are sold in the market are expensive. They provide the same nourishment to the baby as any other weaning foods prepared by the mother at home. Hence always prefer home prepared and fresh food for your child.

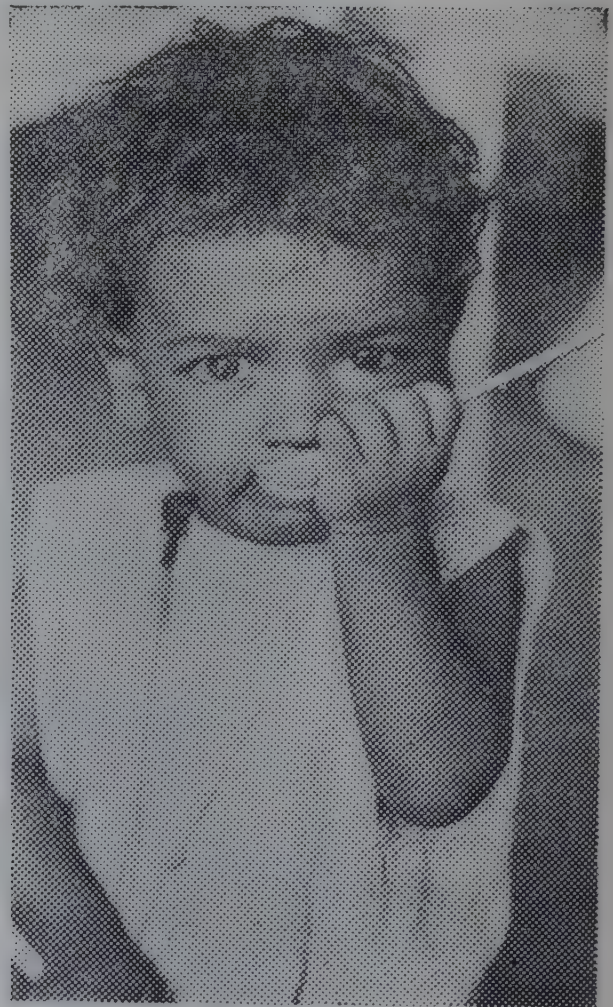


5.4 Start adding semi-solid to the child's diet from the fourth month onwards.



### 6-9 Months

The baby is now taking some fruits and cereal. Seasonal vegetables like greens, marrow, beans, peas, carrots, etc., can be boiled or steamed. Potatoes are a good food. When the vegetables are soft, these can be mashed and given in a semi-solid state. Again, add some oil. These, too, can be gradually increased to 50 g. Vegetables cooked for the family can also be given to the baby after mashing them provided they are not spicy. There is no point in giving only the water in which the vegetables have been cooked as many mothers tend to do. It has no food value as far as calories go. The same applies to the soups. They take a long time to cook and taste good but often have little food value. However, their food value can be increased by thickening them with mashed vegetables or flour and by adding a little oil, butter or cream. The child by this age is sitting up and is beginning to teethe. He likes to use his hands and puts everything in his mouth. He can be given a piece of toasted bread, crisp roti, biscuit, a piece of carrot, etc., to nibble on. He should be encouraged to feed himself.



### 5.5 Encourage the child to feed himself.

### 9-12 Months

A variety of household foods can be given 4 or 5 times a day. Combination of rice and legumes (khichri) is quite popular or rice and dal can be given as such. Idli, uppma and similar household dishes are popular in the South. Besides, a variety of vegetables and seasonal fruits can be given. Foods like curds, egg, khir, dalia, bread, etc., can be given. A roti can be softened in milk, dal or gravy. The egg can be given as boiled or scrambled. The popular belief that raw egg and milk (egg flip) is more nourishing than cooked egg and milk separately is not correct.



### 1-1/2 Years

The aim should be that by this age the child is eating all the household diets. It may still have to be softened and given without spices. By this age, the mother probably has only 200 to 300 ml of milk, so the bulk of the energy (1000) has to be supplied by the solids. The mistake that most mothers make is that they give a variety of food, but in very small quantity, which does not contribute much to nutrition. Even the dal, khichri, etc., should not be made too thin and watery, because the bulk of the feed in that case will be water only. A little oil or ghee should be used in cooking as these are very rich sources of energy.

Most of the foods mentioned above are bulky and the child cannot eat more than 2 to 3 oz (50 to 75 g) at a time. So more frequent feeds will have to be given and the child may eat every 2 to 3 hours, i.e. up to 5 times a day. (See Chapter 8 regarding methods of reducing bulk).



5.6 This boy is aged 2 years. In front of him is the quantity of food that a two year old child can and should eat each day. This represents 1000 calories. This is nearly half of what his mother needs.

### Points to remember about feeding

It should be remembered that there are no set rules about feeding. It has to be a matter of commonsense. Like grown-ups, babies, too,





5-7 On the right is 1000 calories in uncooked form including dark green vegetables, rice, wheat flour and dal with banana. On the left is the same food after cooking. The quantities of food photographed on this page are taken from Annexure I, Chart 4.

like a particular food more than another, and are more hungry on some days than on others. Force feeding should be avoided. Meal times should be pleasant and not a torture. To have some accurate idea of the amount the baby has eaten, he should be fed in a separate bowl or plate. Bowls come in different sizes and before giving advice, one should be familiar with the sizes. The shape should be such that they can be easily cleaned. The edges should be rounded, so that they do not hurt the child. Any metal or plastic material can be used. While it is convenient and hygienic to feed with a spoon, hand feeding should not be looked down upon. This is an accepted method of eating in most parts of India. What should be stressed is that the hands should be clean, and the nails cut short and frequently scrubbed.

Even if the mother understands the nutritional needs of her child and methods of feeding, she herself may not be available for feeding the baby at all times because she may be away from home and working. The foster mother is usually the older sister, who may be only 8-10 years old and has not got the tact or the patience to feed the child. The food requirements of the baby might not have been explained to her and she may feed it only



when she herself is hungry. Besides being a child herself she is interested in playing and doing something more interesting than feeding the young infant. Also she may not follow the advice regarding hand washing and protecting the food from flies and dust by covering the food and utensils. A working mother is an intrinsic part of our agricultural rural scene and, besides, is an economic necessity. This makes the problem of nutrition for the child even more complex.

### **Traditional pattern of weaning in different parts of India**

Most studies have shown that very little solid food is given to children under the age of 1 year. Till then, breast milk and diluted animal milk is given. Unless the quantity of both or either is adequate, malnutrition is bound to supervene. When weaning starts, tradition, cheapness and local availability seem to determine the choice of food. The food chosen is that which requires a minimum of extra and separate cooking. In Tamil Nadu and Kerala, tapioca, banana, ragi gruel and some conjee is given. In Andhra Pradesh, boiled polished rice is generally used with dal, or rice gruel is given with ghee. In some areas of the south, biscuits and rusks are preferred. In Calcutta, rice conjee is usually the first non-milk food, later followed by various kinds of rice like puffed rice, flat rice or fried rice. Barley, sago and arrowroot is sometimes given. In Bombay too, rice gruel is usually the first food. In Rajasthan, preparations made from jowar and bajra flour are used.

In and around Delhi, khichri, dalia, roti, sago, suji or rabri is given. Rabri is prepared by soaking bajra or wheat flour in butter-milk and cooking on a slow fire. Churi (mashed chapati with ghee and sugar) is prepared in Punjab. Panjiri is also used for little older children. Because of their easy availability, biscuits and bread are being used more and more.

On the whole, the tendency is to give a little of the family food to the child rather than to cook separately. Advantage should be taken of this and the mother taught to soften some of the foods for the baby, for example, by soaking roti in milk or dal, softening and mashing the rice, soaking biscuits or bread in milk, mashing the vegetables, etc. By adding 1-2 teaspoons of oil or ghee, the energy density can be increased. The important thing is to make her aware of the *quantity needed for the child* and the *frequent intervals at which it has to be given*. Putting the child's portion in a separate plate or bowl, rather than feeding from her own plate, helps in judging the quantity the child has eaten. □

## SUBSTITUTES FOR BREAST FEEDING

Chapter 4 has emphasised the importance and advantages of breast feeding. More and more evidences are being produced to confirm that this is the best food for the baby. Any milk other than breast milk has no anti-infective properties to protect the infant in the early months. Besides, it is almost impossible to prepare a hygienic bottle feed in a poor environment with shortage of fuel, clean water and clean utensils. The mother's lack of knowledge of how to prepare the feed, and in what proportion milk powder and water should be added, is another problem. Because of the high cost of milk, she tends to add more water to it, to make the tin last longer, thus resulting in underfeeding of the baby. The same happens when fresh cow's or buffalo's milk is used.

Even in affluent homes, where much better facilities are available and cost is no problem, while the infections can be minimised, the high protein and high mineral content of animal milk pose a serious problem. Official advice in most affluent countries strongly advocates breast feeding and more and more educated women are breast feeding their babies now.

Nevertheless, it will always be true that for one reason or another, a minority of mothers will not be able to adequately breast feed their babies. It is because of them that this chapter is written: if one has to bottle feed, it had better be done properly. But it remains true that most of those who believe they cannot breast feed, could do so if they were psychologically receptive and more motivated.

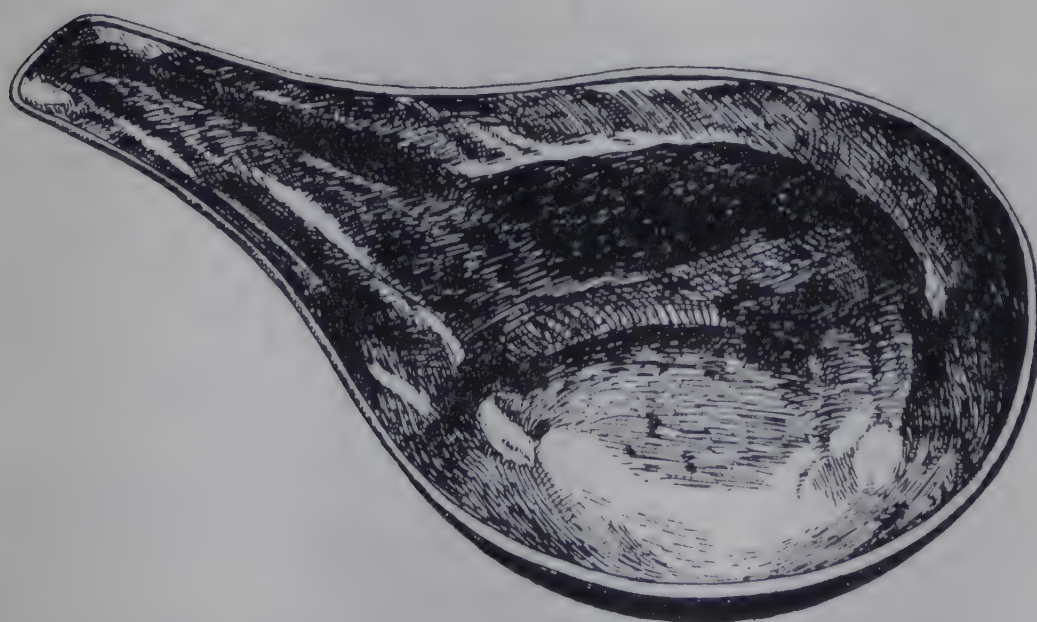
The milk of animals is, of course, an excellent food for children. If the mother's own milk goes down considerably then by the age of 6 months one or two feeds of animal milk can be offered with advantage (150 to 200 ml). If, however, the family cannot afford milk then one can manage with breast milk only and give the whole of the balance of requirements as semi-solids and solids. A child of 1 year needs no more than 500 to 600 ml of milk. Milk is a prestige food and most mothers who can afford it, over-do it. Some who give their babies 2 litres of milk a day have been known to complain that the baby does not eat anything else. On the other hand, the poorer mothers often give wrong information regarding milk



and have a sense of guilt because they cannot afford more of it for their child. If the economic condition of the family allows, then some animal milk (goat, cow or buffalo) should be given along with semi-solids and solids. The milk should not be diluted. The protein in milk is of superior quality and milk is a rich source of calcium, phosphorus and riboflavin, and a reasonable source of vitamin A. Some babies do not like milk. Force should not be used because milk can be offered in so many ways—curds, porridge, kheer and cottage cheese (panir).

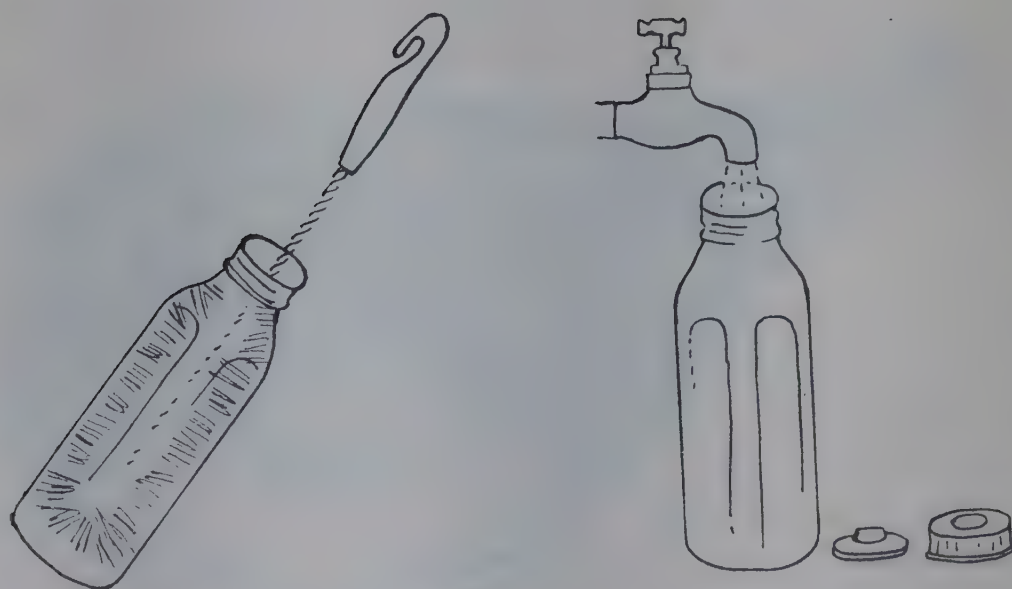
### Bottle or cup

A filthy medicine bottle with a teat on it, wrapped in a dirty cloth with flies on the teat, is a common sight, and obviously a source of infection. For the first few months of life, the baby finds it difficult to take the milk with a spoon or a cup and so a bottle feed may have to be given. While feeding with a spoon, most of the milk drools out because of the forward and backward movements of the baby's tongue. To avoid this, mother tends to put the milk at the back of the throat each time the baby opens his mouth. This may lead to choking with aspiration of milk into the air passage and lungs. Besides, the mother steadies the spoon with her index finger in it, rather than holding the handle. This leads to infection. Some of the traditional spoons called *palada* in South India (see illustration), *jhinook* in Bengal, *bondla* or *gokhari* in Marathi, are much better, because they have a longer rounded spout, which facilitates feeding, are convenient to hold and easy to clean. The other traditional pot with the



6.1 This traditional feeding vessel (palada) is easy to clean.

6.2 This traditional feeding device cannot easily be cleaned.



6.3 Rinse the bottle soon after the use. Clean the teat and cap thoroughly. Use a little salt to clean the nipple. Clean the bottle with bottle brush. Rinse the bottle thoroughly.



spout, also commonly used, is not suitable, as it cannot be cleaned properly. These are further reasons for encouraging the breast feeds, as after the age of about 5 months the baby can drink from a cup or glass. Bottles and teats are much more difficult to keep clean and are an added expense, so wherever possible, a cup should be preferred. If, however, a bottle is needed, the mother must be taught in detail how to keep it clean. The bottle should be properly cleaned with soap and water, using a brush and then boiled for about 10 minutes. The teat, too, should be boiled. Salt is excellent for removing milk curd from the teat. The water after boiling can be drained and the pan covered to keep out the flies and dust. Ideally, the bottle should be boiled before every feed, but that may not be possible with limited time and fuel. In that case it may be boiled once or twice a day, and at other times thoroughly cleaned with soap and water. If a mother can afford it, she should be advised to keep 2 or 3 bottles, so that she doesn't have to resort to boiling a bottle before every feed.

A solution of sodium hypochlorite (Milton or Steriliq) can also be used for sterilising the bottles instead of boiling them. One tablespoon of the solution is added to a litre of water and the bottle is soaked in it for 3 to 4 hours. Before using the bottle for feeding, it should be drained properly. Fresh solution is made every day. The manufacturers of Steriliq recommend soaking for 1/2 hour only.

A cup or a glass is much easier to clean, and so, as soon as possible, the baby should be encouraged to drink from it. As mentioned earlier, it is usually possible to feed a 5-month old baby with a cup. Many mothers continue with bottle feeding for their own convenience, and not because the baby cannot drink from a cup.

### Types of bottles

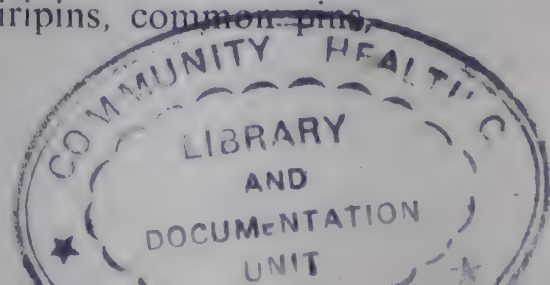
Various types of bottles are available. Several bottles now have plastic tops on to which the teat is fixed. One should ensure that the plastic can stand repeated boiling. Glass bottles are preferable because of easy visibility, even though metal and plastic bottles are cheaper because they do not break. Either the bottle should have clear markings or the mother should measure the milk in a cup or a glass and then put it in the bottle, so that she knows how much milk the baby has taken.

### Making hole in the teat

Most teats have already got a hole in them when you buy them. In case the hole is too small, it can be made bigger with a sewing needle. Make it red hot by holding it in the fire with a pair of tongs, and then pierce the teat with it. It is not advisable to do this with hairpins, common pins, or with the teeth, as some mothers tend to do.

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### Simple problems with bottle feeding

A baby may be crying for a feed and yet when he is offered a bottle he may push it away. This may be due to a blocked hole in the teat, or the milk may be too hot or too cold, or too sweet or not at all sweet. All this should be looked into. Another problem is that sometimes a vacuum is created in the bottle, especially with a very soft, worn-out teat so that baby cannot suck. Simply by lifting the edge of the teat and allowing the air to enter the bottle the problem can be dealt with. Some teats are available now which have a device for dealing with this problem.



6.4 Wrong position. The child is getting air along with the milk.



6.5 Correct position. If bottle feeding is necessary, use a wide-mouthed bottle.

If the hole in the teat is too big or too small, the baby will reject the bottle, or choke, or get exhausted. The hole in the teat should be such that if you press it, as a baby would while sucking, a thin stream of milk pours out.



The bottle should be held obliquely so that its mouth remains full of milk. This prevents excessive swallowing of air. Sometimes if the hole in the teat is too big, the mother holds the bottle horizontally, allowing very little milk to go into the teat, the baby swallows a lot of air while taking the feed, his abdomen gets distended, and he vomits it all out.

Type of milk, and how much to give

Animal milk commonly used in India is that of the goat, cow and buffalo. In several urban areas there are milk schemes in which milk of a certain fat and solid content is sold. The difference in the various types of animal milk and human milk are given in the following table:

Composition of Milk (per 100ml)				
	Carbohydrates (g)	Protein (g)	Fat (g)	Energy (g)
Human	6.8	1.5	4.0	68
Cow	5.0	3.5	3.5	66
Buffalo	4.5	4.3	7.5	103
Goat	4.5	3.7	4.8	76
Camel	4.1	3.7	4.2	69

Vitamin Content of Milk (per 100 ml)			
		Cow	Human
Vitamin A ug	(summer)	45	50
	(winter)	30	—
Vitamin D ug	(summer)	0.04	0.03
	(winter)	0.01	—
Thiamine	(mg)	40	17
Riboflavin	(mg)	150	30
Nicotinic acid	(mg)	80	170
Vitamin C	(mg)	2	3.5
Calcium	(mg)	120	25-35
Phosphorus	(mg)	100	10-20

Source: Human Nutrition and Dietetics, Davidson, Passmore, Brock, 1973).

The energy content of buffalo's milk is higher than the others because of its high fat content, which also might make the milk difficult to digest. This can be remedied by boiling the milk and allowing it to stand for some time. The thick cream on top can be removed and this will reduce the fat as well as some case in in the rest of the milk. This cream can be eaten with fruit or roti or used for cooking. Because of the low carbohydrate content, and also because children like sweet milk, one level teaspoon of sugar can be added to 75—100 ml (half a cup) of milk. This also increases the energy content. One teaspoon of sugar supplies about 15 calories.

There is a widespread custom to dilute the milk for the baby. Some times the amount of water added is more than the milk. Obviously this type of milk feeding will lead to gross under-feeding. The child will remain hungry and will not gain weight. Some will dilute it due to ignorance, others due to the high cost. Milk from a reliable source may be diluted with water in a ratio 3 : 1 (3 parts of milk and 1 part of water) for the first 2-3 months only. Sugar should be added as advised above. If the quality of milk is unreliable, as is often the case, then it should not be diluted. The quantity of feed will vary to a certain extent with each baby, but the following is an approximate guide:

Age of infant	Approximate amount of feed
Birth to 1 m	50— 75 ml (2-3 oz) 6—7 times a day
1 m to 2 m	75—100 ml (3-4 oz) 6—7 times a day
2 m to 4 m	100—125 ml (4-5 oz) 5—6 times a day
4 m to 6 m	150—175 ml (6-7 oz) 4—5 times a day
Beyond 6 months	175—200 ml (7-8 oz) 4—5 times a day

If the baby is happy and he is gaining weight, he is being adequately fed.

For more prosperous families, powdered milk can be advised. It is important to explain the details of the method of reconstituting the milk. Most mothers have very little idea about this and give a more dilute milk than they should. The scoop in the tin should be filled level for the correct amount. The hands should be washed and dried before taking out the milk. The bowl and the spoon used for reconstituting should be boiled along with the bottle. The water used for reconstituting the milk must be boiled. Most of the tinned milks have similar formulae and there is no point in changing from one to another because the first one has not “suited” the baby. If the baby has diarrhoea, most probably the cause will be an infection,



even though, rarely, milk allergy or lactose intolerance must be kept in mind. Modified milk formulae to bring them closer to breastmilk composition, are becoming available in India.

The following points summarise the requirements for artificial feeding:

1. Good knowledge
2. Facility for boiling and sterilising
3. Good source of water
4. Reliable milk supply
5. Adequate washing facilities
6. Sufficient money
7. Time to prepare feeds.

The preceding description shows the advantages of breast feeding and the problems of bottle feeding. Breast feeding is simple, readily available and clean. The mother does not need to know the quantity of milk the baby requires. All that the mother is concerned with is a happy, contented baby who is growing well. On bottle feeds there is the problem of cleaning and sterilising the bottles and teats, buying milk, worrying about it going bad because of hot weather, and very often not having the knowledge about how much to give and how to give it.

In a poor socio-economic illiterate community, breast feeding can make the difference between the life and death of the baby. The infection rate in bottle fed babies is high. Of all the babies that come to a hospital or clinic with diarrhoea, hardly one of them is entirely breast fed. Diarrhoea leads to malnutrition and further dilution or reduction in the amount of milk by the mother, which makes malnutrition worse, and so the cycle goes on. The advantages of breast feeding are so obvious that it is surprising how little is the commitment of most health workers to it. But the situation is changing gradually. The advantages of breast feeding need to be emphasised again and again both to mothers and to health workers. ☐

## MAIN CATEGORIES OF FOOD

### Cereals

Different cereals are eaten in different parts of India. In the south, rice is eaten as a staple; while in the north, wheat is predominant. But food habits are changing and most people eat a mixture of two or three cereals e.g. rice, wheat, millets and jowar. Millets and jowar are cheaper but many people consider them low prestige foods, and so prefer to eat wheat and rice. It is important to get the best value for the money spent and so more of the coarse cereals can be bought in the same amount of money. This will contribute to better nutrition. Cereals contain 7 to 14 per cent protein and about 75 per cent carbohydrate. Rice has 7 per cent protein but it is of better quality. It contains little cellulose and is well absorbed. Rice is eaten boiled, and as puffed or flattened rice.

The nutritional value of maize is similar to that of other cereals, but there are some differences. Although yellow maize contains carotenes it is a poor source of vitamin A. The principal protein is Zein which forms half the total protein. Zein is relatively deficient in the essential amino acids, lysine and tryptophan. Tryptophan is converted in the body into vitamin, and nicotinic acid. Nicotinic acid is also present as such in cereals, but in maize most of it is in a bound form and is not available. Pellagra is a deficiency disease produced by lack of nicotinic acid, and therefore is often associated with maize eating.

### Tubers and starchy roots

These are eaten mostly in addition to cereals. Common tubers are potatoes, sweet potatoes and colacasia (arwi). In parts of Kerala, tapioca is eaten instead of rice because it is cheaper. This is mostly carbohydrate and, if eaten alone, can result in protein deficiency. Fortunately in the areas where tapioca is eaten, dry fish, which is a rich source of protein, is also available. However, it is not always fed to young children for economic or other reasons, and protein calorie malnutrition is not uncommon.



Potatoes are a good source of vitamin C, although two-thirds may be destroyed in cooking. These are very popular with children and they can consume large quantities. They are a very rich source of energy and can replace part of the cereal intake. Sweet potatoes, too, are rich in energy and are eaten boiled or roasted.

### **Legumes**

The Indian diet has several kinds of legumes such as lentils, Bengal gram, red gram, black gram, horse gram, rajma, lobia, etc. Red gram is eaten mostly in the south, west and the central parts of India. In the north, pulses with husk are preferred. These form an essential part of the diet unless dire poverty precludes their use. Their protein content is 20 to 25 per cent. The immature legumes do not have much protein in contrast to the dry legumes which are rich in proteins. They are useful sources of vitamins and minerals. Sprouted legumes are a rich source of vitamin C. Roasted gram is a very popular snack. It is also eaten as chicki, along with groundnuts and gur.

Recently soyabean has become quite popular in urban areas. It contains 40 per cent protein. It has a rather bitter taste and a brownish colour, but by newer methods of processing, the taste can be masked.

### **Oilseeds and nuts**

These are rich sources of protein, but are mainly used for extracting oil. The remaining cake, which is very rich in protein, is unfortunately rarely utilised for consumption but is given to animals. Some is now being processed for feeding children. Roasted groundnuts are consumed a great deal in winter months. In Maharashtra and Gujarat, green boiled groundnuts are very popular. Cultivation of sunflower is also being promoted.

### **Vegetables**

There are innumerable varieties of vegetables. They are low in calories and proteins and add bulk to the diet. They are, however, rich sources of vitamins A, B and C and of iron. The dark green or yellow vegetables are especially good sources of vitamin A. Children on the whole do not seem to relish vegetables, but should be encouraged to eat them because of their vitamin and mineral content.

## Fruits

These are tastier than vegetables and are eaten raw and so the vitamins are not destroyed. Different regions of India produce different fruits, but unfortunately they do not reach the rural areas except bananas, guavas, melons and mangoes. In the hills, pears, apples, plums, peaches, etc., are available. Bananas are rich in carbohydrates and supply 80 calories per 100 g. They are easily digestible and very good as a weaning food. Citrus fruits are rich in vitamin C. Guava, however, is far richer than orange but the amount depends on the freshness of the fruit. Mangoes and papayas are rich sources of vitamin A. Grapes are prestige fruits. They are expensive and supply only sugar. In some parts of Andhra Pradesh they are being cultivated extensively and are comparatively cheaper. Lemon juice with sugar is a favourite summer drink. It supplies both calories and vitamin C.

A lot of money is spent on mosumbi because of the belief in its health giving properties. The money spent on this can be utilised better on a more nutritious food such as egg or milk.

## Fats and oils

These are essential for cooking and supply calories to the diet. Solid fats like butter and ghee (clarified butter) and other animal and some vegetable fats contain largely saturated fatty acids. Liquid oils on the other hand are rich in unsaturated fatty acids which are considered better for the heart. Animal ghee is greatly valued for its flavour and food qualities and has high prestige value, but its use is negligible now because of its high cost. Different oils are used in different parts of India for cooking, like mustard oil in Bengal, Assam and Kashmir, and groundnut oil, gingely oil, til (sesame) oil in other parts of India. In urban areas, a great deal of hydrogenated oil or vegetable ghee is used. This is fortified with vitamins A and D. Fats and oils are the richest sources of energy and their addition to the diet increases the calorie content. Because of their cost, their use is restricted, but efforts should be made to include some in the diet.

## Sugar and jaggery

In rural areas, gur is the common sweetening agent, but refined sugar is being used more and more because of its prestige value.

Gur or jaggery is cheaper and contains per 100 g, 11.4 mg iron, 168 mg carotene and 80 mg calcium. It has small quantities of vitamin B,



riboflavin and niacin. Sugar, on the other hand, is devoid of all these minerals and vitamins. The energy content of both is about 390 calories per 100 g.

### **Fresh condiments and herbs**

The main items are ginger, mint, coriander and green chillies. These, together with onions (green or dried), are eaten as chutneys for increasing the flavour of food or to replace vegetables in poor homes. They supply some vitamins to the diet. It is amazing how many chillies and spices even the young children can eat. Curry leaves are used all over India in dal and vegetables as flavouring agents.

Dried spices are mainly used for flavouring and do not themselves contribute any nutritional value to the food.

### **Foods of animal origin**

These have high quality protein, but their use is limited because of their high cost. They are easily digested and are a source of vitamin B<sub>12</sub> in the diet. They also help the absorption of iron from the diet.

#### *Meat*

Meats are a good source of protein, vitamin B and iron. Their protein content is about 18 per cent. The amount of fat varies. Liver is a good source of iron, vitamin A and vitamin B, and a little of vitamin D.

Indians are conservative about which meats they eat. Mutton and chicken are the main varieties eaten, though pork and beef are also eaten by some. Under-cooked meat may be a source of tapeworm infection.

#### *Fish*

Fish is mostly eaten in the coastal regions. In Bengal, river fish is preferred. Some fish, like sardines and hilsa, are rich in oil. Fish is a rich source of protein and vitamins A and D. Dry fish is very rich in protein. Fish bones are rich in calcium and can be eaten along with the flesh when the fish is small.

#### *Eggs*

These are rich in essential nutrients. An average hen's egg contains 6 g of protein and 6 g of fat and gives about 80 kcal. Egg yolk is a rich source of vitamin A and B.

## **Milk and milk products**

While milk is an excellent food for children, it has been shown that children can grow satisfactorily on a diet composed entirely of cereals and vegetables with no milk. (Widowson and Mc Cance -1954), as quoted by Davidson, Passmore and Brock in Human Nutrition and Dietetics). So the inability of many people to provide milk for their children should not depress us unnecessarily as long as appropriate alternatives are given. But during the first year of life, milk, especially human milk, is extremely important.

### **Human milk**

#### *Colostrum*

This is a yellowish secretion produced during the first 3 or 4 days of lactation. It contains more protein but less sugar and fat than mature milk. The globulin content is high and it is rich in protective antibodies, particularly polio antibody. Because it looks thick and yellow, many mothers think it is an unsatisfactory product and discard it. This is an extremely bad practice. Colostrum is very valuable for protecting the newborn baby from infections.

#### *Mature milk*

This is low in protein as compared to cow's or buffalo's milk. The human baby grows much more slowly than the calf and so its need for protein is less. The casein content in human milk is one-sixth that of the cow's. The amino acid content is similar.

Lactose is the principal carbohydrate in milk. Its presence in the intestine stimulates the growth of micro-organisms and helps in the synthesis of vitamin B. Human milk contains one and a half times as much lactose as cow's milk.

Milk has a low content of iron and copper which are required for blood formation, but is rich in potassium, calcium, phosphorus, chlorine and sodium. Vitamin A is present in adequate amounts. The quantity of vitamins B and C depends on the mother's diet.

The composition of human milk has evolved over aeons (immeasurable period) of time so that it is the perfect food adapted to the needs of the human infant.



### Animal milk

Milk of several animal species is used in India as a food for humans. The goat is the poor man's cow. It feeds on other peoples hedges and bushes and does not cost the owners anything. The amount of milk the goat gives is enough for the baby, provided other food is also being given. Cow's milk is preferred to buffalo's because of its lower fat content, but it is not so easy to get partly because of the low milk yield of indigenous cows. In hill areas, cow's milk is more popular, but in the rest of the country, buffalo's milk is more commonly used.

All types of animal milk provide high quality protein, mostly in the form of casein in contrast to human milk protein which is mainly lactalbumin. Human milk has a higher sugar (lactose) content than cow or buffalo milk. The fat content of buffalo's milk is almost double that of human or cow's milk. Milk is a rich source of riboflavin and calcium, and contains some vitamins A and C. Milk is a poor source of iron, and babies who are exclusively milk fed, tend to develop anaemia. Goat's milk does not contain any vitamin B<sub>12</sub>.

### Milk products

#### *Curd, cottage cheese (panir), khoya and butter*

Curd is a popular food in most parts of India, particularly in summer. A small quantity of curd is used to set the milk which is kept overnight. Firm curd is set by next morning. Curd has the same food value as milk. In north India, curd is churned, the fat separated as butter, and the remaining lassi used as a drink. Lassi is rich in lactose and proteins and is a cooling drink in summer.

Panir is made by adding some lemon juice to boiling milk. The curdled portion is tied in a cloth and hung for a few hours until most of the water is drained out. The solid portion of panir can be cooked in several ways and eaten as a savoury or as a sweet. Sweets such as rasgoolas are made with panir. The whey which is drained out contains lactose, thiamine, riboflavin and some lactalbumin; it contains no casein or fat. Cheese is rich in protein and fat.

Khoya is made by cooking the milk on a slow fire till it is dry. It is used for making sweets, and is rich in proteins and fats.

Butter is made by churning the curd and removing the top fat. Its only constituent is fat, and therefore contains some vitamin A. Cow and buffalo milk fat contain about the same amount of vitamin A, although the latter does not have any carotene naturally present. □

## PROCESSING OF FOOD

### Cooking

Most foods, except fruits and a few vegetables, are cooked before they are eaten. This improves the taste, flavour and digestibility. It also reduces bulk and the water content. Disease-causing bacteria are destroyed. The starch and other nutrients within the foodgrain become more easily accessible to the digestive enzymes. Cooking makes meat softer and capable of being chewed. Pulses and legumes become more digestible. The biological value of proteins in some foods also improves on cooking.

Cooking involves many processes like boiling and steaming or frying, roasting or baking. Boiling and steaming result in comparatively greater losses of nutrients, particularly when the water is thrown away as in the case of rice or some vegetables. If root vegetables are boiled in their skin then the losses are small.

Ordinary cooking causes little loss of protein, fat and carbohydrates in cereals, pulses and meat. In vegetables there is some protein loss on boiling in water, particularly when salt is used in cooking and the water thrown away. Boiling milk makes it safer by destroying the bacteria. It also softens the proteins and makes them easier to digest, particularly for a young infant. Vitamin C, however, is destroyed by boiling. Exposure to light also destroys riboflavin and vitamin C.

Addition of certain substances while cooking also affects the losses. If soda is added to the food, it facilitates cooking and preserves the colour but destroys most of the thiamine. On the other hand, a highly acid substance like tamarind preserves the vitamins.

The longer the food is cooked, the greater is the loss of nutrients, particularly thiamine and vitamin C. If food is cooked in a small quantity of water which is not discarded, the loss is not much. If more water is added, it should not be thrown away but should be used in dal, soup or gravy. This water also contains minerals like sodium and potassium. Cooking with the lid on preserves vitamin C. Steaming the food preserves the nut-



rients. For those who can afford one, a pressure cooker is valuable because it preserves the food value and saves a lot of time and fuel.

### **Cutting and trimming**

Vegetables are peeled and cut for cooking and washed. If soaked in water, nutrient losses can occur—the finer the vegetable is cut, the greater the losses. Removing leaves removes a good source of carotene. As far as possible, leaves of radish and turnips and outer leaves of cabbage should be used.

### **Sprouting**

Sprouting the legumes is common all over India. These are eaten lightly cooked or even raw in salads. Sprouting improves nutrient value and digestibility and some toxins are destroyed. Vitamin C and riboflavin are synthesised, but cooking destroys much of the vitamin C.

### **Malting**

Malting breaks down the starch in the grain into sugars. The grain is dampened to allow it to germinate, then it is dried, dehusked and milled. The malting process increases the riboflavin, niacin and iron content. Gruel made from malted flour is less thick, and so more flour can be used to make gruel compared to ordinary flour. This increases the energy density of food which is important for feeding young children.

### **Fermentation**

This increases digestibility and adds distinctive flavour to the food. A commonly used fermented article is dahi (curd) which is eaten all over India, and is considered more digestible than milk during intestinal disorders. The dal and rice mixture for making idli and dosa is also slightly fermented. In north India, khamiri roti is popular. This is made from a mixture of fresh and fermented dough. In Gujarat, dhokla is very popular. This is a mixture of red gram dal and rice and is steamed after fermentation. Fermentation involves the growth of micro-organisms which improve the nutritional value of the product.

### **Drying**

Fish is commonly dried in the coastal area and is an excellent source of protein and calcium. Seasonal vegetables are also dried by housewives, but common methods involve the loss of much of their flavour and nutrients;

these are reduced if the foods are first plunged into boiling water and then dried in the shade.

### **Milling**

Hand-pounding is being replaced by milling even in the rural area. Milling is labour saving, and is done to make cereals edible. It improves digestibility by removing the fibre, but unfortunately quite a lot of the nutrients are lost also, e.g., thiamine and niacin and some riboflavin, calcium, iron and protein.

Wheat is converted into atta and maida. Atta is used for making chapatis, while maida is used for baking bread, making sweets and puris, nans, etc. Advantages of maida are that it is whiter, it has less phytic acid, has a finer texture and is better absorbed. Disadvantages are that more vitamin B, calcium and iron are lost. So, atta is preferable to maida.

### **Parboiling**

This is a process in which the rice is first soaked in water, then steamed and dried. This process drives the nutrients into the interior of the grain and subsequent milling does not destroy as much vitamin B and minerals. Parboiled rice is more resistant to insects and fungus. The disadvantage is that it has a peculiar smell which may be due to poor attention to processing. The grain also does not look so soft and smooth as the grain of the non-parboiled rice. Parboiled rice is eaten a great deal in southern India and in Bengal. Khesari dal can also be parboiled to destroy the toxins which cause lathyrism resulting in paralysis. Parboiling is a traditional process that enhances nutritional value. It should be encouraged. (Gopalan C., Mohan V.S., and Nagarajan B., *Ind. J. Med. Res*, Vol. 54, 410; 1976).

### **Storage**

With improper storage, food can become infested with insects. This happens particularly during monsoons when humidity is very high. Rats also flourish. In India, 8 per cent of all the grain stored is eaten up by rats. Dampness can lead to fungus contamination which can be very toxic to the body. Recently there was an epidemic of liver disease and jaundice in Gujarat and Rajasthan due to eating maize contaminated with the fungus aflatoxin. This fungus can also contaminate rice and groundnuts. Articles of food should be dried in the sun and then stored in moisture-proof containers or bags and kept in a dry place. If pesticides are added to stored grain, it should be washed well before use. ☐



MAJOR CAUSES OF MORBIDITY AND MORTALITY

With adequate breast feeding, the growth pattern is normal for the first few months of life, but if the breast milk is not enough or solid foods are not introduced at the right time, the baby does not gain weight. His weight curve becomes flat. Infections also supervene because of the commonly unhygienic way of supplementing food and giving milk with unclean bottles. Unfortunately, because of the myths attached to teething, the parents usually do not seek advice till the condition becomes serious. Any problem—nutritional or infectious—between the ages of 6 months and 2 years, is attributed to teething and considered a normal pattern for that age. In a normal healthy child, there should be no problem with teething except some discomfort, peevishness and, perhaps, reluctance to suck when the gums are inflamed. So medical advice should be sought for all infections and inadequate weight gain.

According to the nutrition survey of ten States by the National Nutrition Monitoring Bureau 1978, the distribution of malnutrition among children one to five years is as follows:

<i>Grades of Malnutrition (Gomez Classification)</i>	<i>Per cent</i>
Normal (greater than 90%)	14.3
Mild 75-90%	42.4
Moderate 60-75%	34.9
Severe (less than 60%)	8.4

The worst affected States were Maharashtra, Madhya Pradesh, Gujarat and West Bengal (50% or more moderately or severely malnourished). In an earlier report by CARE (1974) even in Punjab which is economically well off, only about one-third of the children were adequately nourished.

While it is easy enough to recognise a marasmic child, it is important to recognise milder cases of undernutrition where timely intervention and advice regarding nutrition can very easily put the child back on the road

to health. This, however, is not easy. The average moderately malnourished child between 6-24 months of age looks normal, but is too small for his age. Most mothers do not realize that anything is wrong. Since most of the children around are the same, the parents consider the lack of adequate growth to be normal. These children have lowered resistance to infection and therefore easily succumb to illness (See Chapters 2 and 14).

All-India statistics show that malnutrition is the underlying cause of death in 7 per cent of deaths in the age group 0 to 5 years and an associated cause in 46 per cent. On the whole, malnutrition is directly or indirectly responsible for over half of the deaths in children under 5 years of age. Since a major portion of the morbidity and mortality in India is due to malnutrition, the aim of the health programme should be to teach better nutrition with a view to :

- (i) prevent mortality under 5 years
- (ii) reduce mortality from protein energy malnutrition (PEM)
- (iii) reduce the incidence of PEM
- (iv) promote satisfactory growth.

### **High death rate and its causes**

Not only is the infant mortality high, but mortality between 1 and 3 years is also high. It has been estimated that a child in India has as much chance of reaching the age of 5 years, as a child in more developed countries of reaching the age of 35-40 years. Proportionate mortality under the age of 5 years is 41.8 per cent and the common causes are malnutrition, and diarrhoeal and respiratory disorders. (Health Statistics of India, Ministry of Health and Family Welfare, 1983).

With the mortality being high, and the desire to have a son being very strong, it has been estimated in the light of the 1971 life tables that parents will have 4 children to ensure a surviving son, in their old age. (Computation from 1971 life tables—personal communication : Asok Mitra).

### **Perinatal mortality**

The perinatal period spans both the intrauterine and extrauterine periods and emphasises the continuity of hazards in the two. It is defined as the period beginning after 28 weeks of intrauterine life and extending up to 7 days after birth. Perinatal mortality includes still births. A high perinatal death rate is an indication of poor maternal health supervision and inadequate facilities for delivery and the care of the baby after birth. The following are some of the common causes of perinatal death:



1. Maternal

- (a) Poor nutrition, particularly anaemia
- (b) Toxaemia
- (c) High parity
- (d) Extremes of age—under 18 years and over 35 years
- (e) Spacing of less than 2 years.

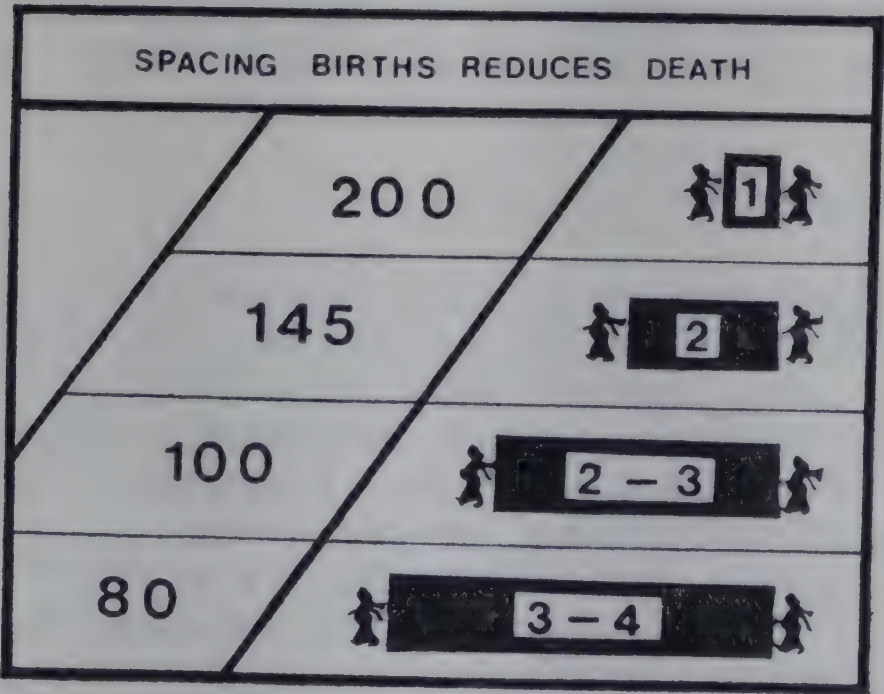
2. Foetal

- (a) Premature baby
  - (b) Small but term baby
  - (c) Twins
- } Low birth weight babies

3. Infant

- (a) Birth injuries
- (b) Asphyxia neonatorum
- (c) Infections including tetanus
- (d) Congenital malformations.

Number of Infant deaths (before age one) per 1000 live births



Births intervals per year

9.1 Spacing births reduces death.

Source : WHO Survey of 6000 women in a developing Country

As will be seen from the above, many of the causes are preventable with proper care of the mother and the newborn baby.

### CAUSES OF PERINATAL MORTALITY

<i>Causes of death</i>	<i>Percentage</i>
Asphyxia	41.6
Prematurity (LBW)	17.9
Congenital malformations	6.7
Septicaemia	2.4
Respiratory distress syndrome	2.2
Anaemia	1.5
Birth trauma	1.2
Multiple factors	11.0
Undetermined	15.5

(Source : Ministry of Health & Family Welfare, Government of India 1983).

Perinatal mortality is roughly 60-70 per 1000 births, and is 3 to 4 times in low birth weight (birth weight less than 2500 g) compared to higher birth weight babies. Almost one quarter to a third ( $\frac{1}{4}$  to  $\frac{1}{3}$ ) babies are low birth weight.

#### Neonatal mortality

The neonatal death rate, i.e., deaths from birth to 4 weeks of age, per 1000 live births, is also high and the causes are almost the same as those for perinatal deaths. Low birth weight and infections are the biggest killers. Among the infections, tetanus neonatorum is frequently seen in rural communities and less often in urban communities due to cutting the cord with an unclean knife or any farm implement, and also because of close contact with animals. It is estimated that between 150,000 and 200,000 infants die due to neonatal tetanus each year. This colossal waste of human life can be prevented by better hygiene during delivery and care of the cord and by giving two doses of tetanus toxoid to the mother during her pregnancy (See Chapter-13).

Low birth weight being an important cause of neonatal death, an increase in birth weight will help reduce deaths considerably.



Infant mortality

Infant mortality is defined as the number of deaths under 1 year of age per 1000 live-born babies. Low birth weight continues to be responsible for many deaths even beyond the neonatal period. The commonest causes of infant mortality are undernutrition and infections, particularly diarrhoea and respiratory problems. Infant mortality is higher in rural as compared to urban regions and there are vast variations in different parts of India, as the following table shows. The lowest infant mortality is in Kerala, and the highest in Uttar Pradesh. Infant mortality varies considerably from one state to the other, as shown in the following table.

Birth Rate and Infant Mortality Rate (1981)—Statewise		
State/Union Territory	Birth Rate	Infant Mortality Rate
Andhra Pradesh	31.5	117
Assam	32.3	118
Bihar	39.1	—
Gujarat	34.5	122
Haryana	36.5	109
Himachal Pradesh	31.5	101
Jammu & Kashmir	31.6	73
Karnataka	29.0	82
Kerala	26.0	42
Madhya Pradesh	37.2	143
Maharashtra	28.4	81
Orissa	32.9	133
Punjab	30.3	117
Rajasthan	36.4	140
Tamil Nadu	27.8	105
Uttar Pradesh	39.6	177
West Bengal	33.2	—
Delhi	26.9	70

(Source : Health Statistics of India, 1983).

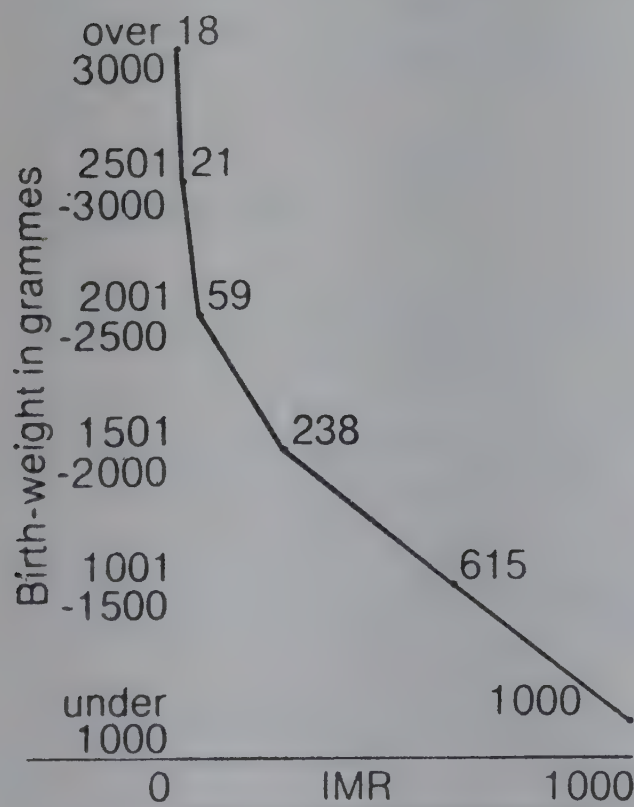
The mortality between 1-4 years is about 45/1000 as compared to 1/1000 for Western Europe and North America. Main causes are the same as in the first year of life. Diarrhoeal disorders are more frequent in children above the age of one year than in infants. (Survey of Infant and Child Mortality, Registrar General of India, 1979).

The mortality among the female children is higher than the males except in the first week of life. This may be due to the cultural bias against the female children.

The following table gives the percentage distribution of ten major causes of deaths in infants and children.

Major Causes of Death in Infants and Children			
0 — 1 year		1 — 5 years	
Disease	% of deaths	Disease	% of deaths
1. Tetanus	15.2	1. Typhoid	11.0
2. Prematurity	7.9	2. Pneumonia	8.4
3. Pneumonia	6.8	3. Dysentery	7.0
4. Dysentery	6.1	4. Jaundice	6.2
5. Influenza	4.9	5. Diarrhoea	5.8
6. Malaria and other fevers	4.9	6. Malaria and other fevers	5.3
7. Typhoid	3.8	7. Influenza	5.2
8. Other respiratory diseases	2.6	8. Other respiratory diseases	2.3
9. Diarrhoea	1.6	9. Gastro-enteritis	1.7
10. Gastro-enteritis	1.3	10. Tetanus	1.4

(Source : Survey of Infant and Child Mortality, Registrar General of India, 1979).



Note: Figures for New Delhi, India, 1969-1974  
Source: Ghosh, et al., 1978.

9.2 Infant mortality in relation to birth weight.



### School children

The above data confirms that the priority areas for health delivery are pregnant and lactating mothers and pre-school children. This does not mean that school children do not need a comprehensive health delivery system, but at that age morbidity and mortality rates are much lower. The school child has already had most of the childhood communicable diseases such as measles, chickenpox and whooping cough; his resistance to diarrhoea and respiratory infections is greater and so these diseases are less severe. He manages to eat more food depending on his hunger, and is not now dependent on his mother to feed him. When hungry, he will find food wherever it is, if it can be found, and eat it. Malnutrition is widespread in school years too, but it is not so severe as in pre-school years and is mostly due to low availability of food in the family.

### Factors responsible for undernutrition

Undernutrition results from the interaction of several factors, all having their origin in poverty and ignorance. The main factors are:

1. *Poor socio-economic conditions*, including low income, poor environmental sanitation and poor housing.
2. *Parental ignorance and illiteracy*, resulting in inadequate food being given, and prejudices against certain foods.
3. *Repeated infections*, such as diarrhoea, and respiratory infections and other infections such as measles, whooping cough and tuberculosis contribute to almost half of malnutrition. These illnesses depress the appetite, consume the energy, cause a loss of body weight and lead to malnutrition.
4. *Large families*. The more mouths there are to feed, the worse is the nutritional status of the children. It has been shown that undernutrition is much less in the first 3 children of a *sib-ship* than in children from birth order 4 and above. (Rao, K.V., and Gopalan, C., Family size and nutrition status, Proceedings of the 1st Asian Congress of Nutrition, 1972).

The percentage of nutritional deficiency signs in children has been shown to increase and dietetic intake decrease by 300 calories and 10 g of protein per adult consumption unit in families with 4 or more children, as compared to one to three. This is quite understandable because in poor homes 80 to 90 per cent of the income is spent on food and there is a limit beyond which more



food cannot be bought. When there are more mouths to feed, each one just has to manage with less, and the brunt falls on small children and mothers.



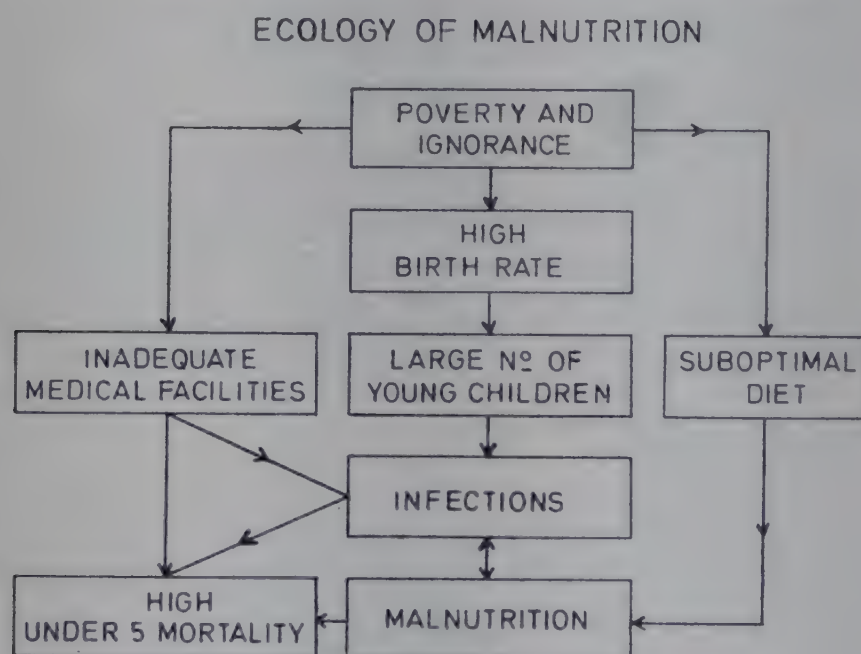
9.3 Even a child in a poor family can be healthy.

5. *Closely-spaced families.* The spacing of 3 years between one child and the next is considered ideal both from the viewpoint of breast feeding and the health of the mother and the child.
6. *Low birth weight.* A small baby is difficult to rear. He is too feeble to suck breast milk and is particularly prone to infections. Mortality is high and those that survive lag behind in growth as compared with normal children. The causes of low birth weight are not adequately understood, but maternal undernutrition, infections and poor environment play a significant part. Frequent pregnancies adversely affect the health of the mother resulting in anaemia and other nutritional deficiencies. In a survey by the National Institute of Nutrition, 30 per cent of pregnant women had a haemoglobin level of less than 10 g per cent. Any nutritional deficiency or infection should be treated during the antenatal period.



### Energy not proteins

The problem in this country is more one of energy than of proteins. Our diet based on cereals and pulses has adequate protein—if enough of it is fed—even though the quality of protein is less than the western type of diet which has more animal proteins. The problem is of inadequate food because of the reasons mentioned above. If enough of the diet is not fed, so that the intake of calories is inadequate, the proteins also are used for energy and not for tissue building and maintenance. The emphasis therefore needs to be on more food rather than proteins.



#### 9.4 A vicious cycle of deprivation.

The *above* diagram 'Ecology of Malnutrition' depicts a vicious cycle of deprivation, with high death rate, high birth rate and undernutrition, each one making the impact of the others worse. While overall economic development is the ultimate answer to the problem, the following inputs can help to break the cycle:

1. Effective child health programme
2. Improved environmental sanitation
3. Nutrition and health education
4. Effective fertility control.



## PROTEIN ENERGY MALNUTRITION

Protein energy malnutrition is caused mainly by deficient intake of energy and usually protein. Repeated episodes of diarrhoea and other infections aggravate it. Death rate among malnourished children is much higher than children who are well nourished.

Marasmus and kwashiorkor are the two main extreme forms of malnutrition. Marasmus is far more common than kwashiorkor in India. The whole spectrum of conditions, including these two extremes and the intermediate “marasmic kwashiorkor” is known as protein energy malnutrition, or as PEM.

### Early detection of PEM

It is important to recognise the early stages of malnutrition rather than to wait for the child to develop the extreme malnutrition picture of marasmus. This can be done by keeping a serial record of weight and seeing whether the child's growth curve is satisfactory or not (see Chapter 2). These children do not gain weight or may even lose weight. It is at this stage that the child should be identified for special care rather than allowing the full blown picture of PEM to develop. But as mentioned earlier, most mothers are not able to recognise early signs of malnutrition. The child for all practical purposes looks normal, but is too small for his age. Soon, however, his muscles become flabby and soft. This is best seen in the thigh and upper arm. Abdomen looks prominent and the child becomes listless and less active than before.

### Signs and symptoms of severe PEM

#### *Marasmus*

This is commonly seen in babies where the breast milk has been inadequate and the mother has been trying to feed the baby on diluted goat, cow or buffalo milk, and due to poor hygiene there is frequent diarrhoea. It also results from the late introduction of semi-solid foods when breast milk is not enough to sustain growth. Repeated infections make the condition worse.



A marasmic baby has very little subcutaneous fat and muscle and is all skin and bones. The head seems proportionately large with very little hair. If the hair has been cut, it does not grow. The child is below 60 per cent of his expected weight for age, and there is also a high deficit depending on the duration of undernutrition. He may have some pigmented or peeling skin lesions. The ribs are visible because of absence of subcutaneous tissue and the normal costochondral junctions may appear prominent and may be mistaken for a rickety rosary. He will most probably have one or more infections.

It is rare for the mother to seek advice for malnutrition alone. The child is apathetic and whining. In extreme cases, he is not interested in his environment and is immobile: he lies or sits in the same position for hours, often with eyes closed. The facial pads of fat are the last to go, and when that happens, the child looks like a wizened old man. Usually there is a moderate degree of anaemia and there may, or may not, be evidence of other deficiencies.



- 10.1 A child with marasmus looks old for his age. He looks worried. He has wasting of muscles and absence of fat. The head looks big. Skin wrinkling indicates recent loss of his weight.

In the early stages, the appetite is good and the child sucks his fingers vigorously and, given adequate food, recovers quickly; but in later stages there is severe loss of appetite and it needs a lot of tact and patience to coax the child to eat. He either will not eat, or will spit out what has been put into his mouth. Often he will just turn his mouth away from food. With patience and by offering sips of milk or another food that the child might fancy, a beginning can be made.





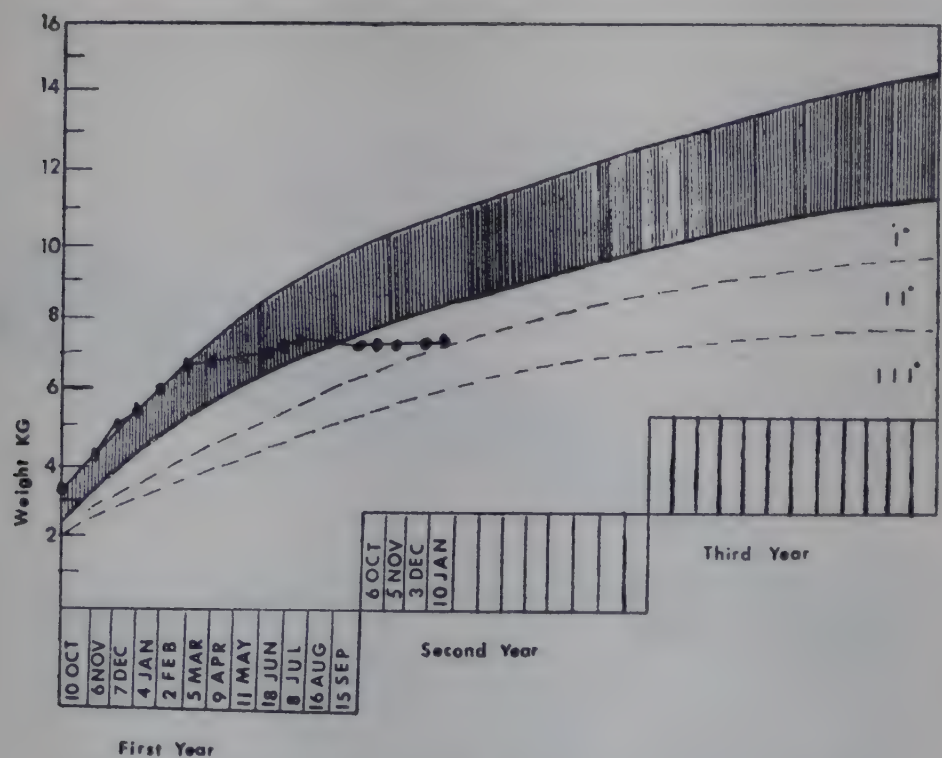
### *Kwashiorkor*

The word “Kwashiorkor” was suggested by Dr. Cicely Williams in the early 1930s. It is an African word meaning “the disease that occurs when the child is displaced from the breast by another child”. The age incidence is a bit later than marasmus and it is uncommon to see this condition under 1 year of age. The weight depends on the degree of oedema, but is usually less than 60 per cent of the expected weight for age. The retardation in height is even more pronounced than in marasmus. Psychomotor changes are supposed to be more in kwashiorkor but, in our experience, they are seen as frequently in marasmus also. The main features are apathy, moon face, scanty lustreless hair and oedema. Skin changes such as pigmented or depigmented patches, peeling and even ulceration are frequently seen. There is still some subcutaneous tissue present.

- 10.2 A child with Kwashiorkor has swollen feet, scaly skin on the legs, and oedemia. He is miserable and irritable.

It has been seen that with the same kind of diet and in the same household one child may develop marasmus, and another, kwashiorkor. A child who did not have oedema when first seen may develop it a few days later. Lack of adequate energy is common to both conditions; hence the term PEM is more correct and suitable than marasmus or kwashiorkor. A moderate anaemia and one or more vitamin deficiencies may be present.



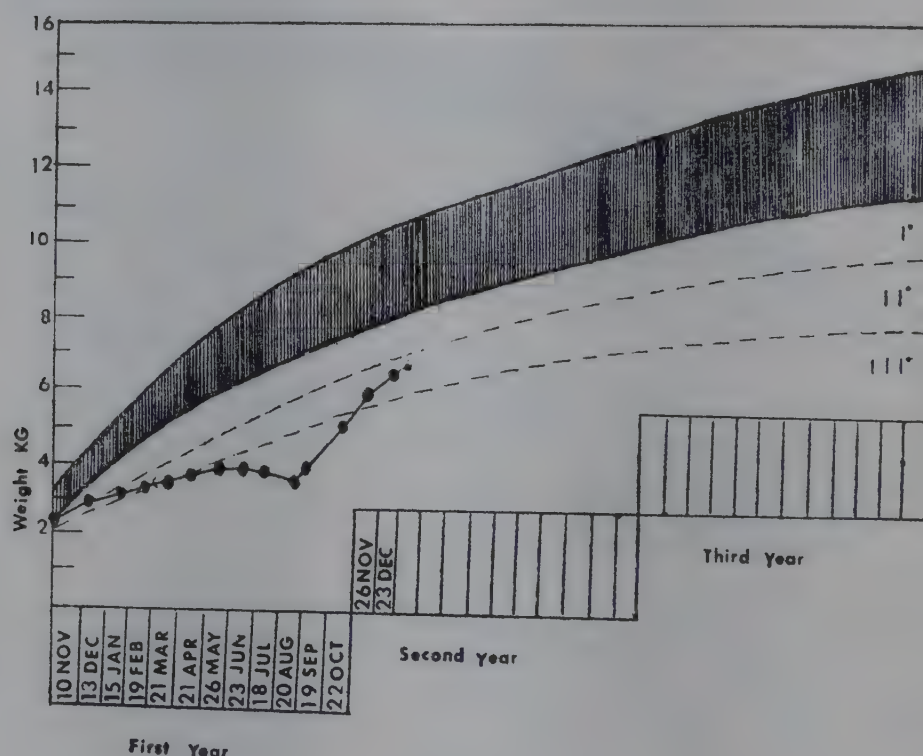


10.3 Failure to add solids results in growth failure.

**Management**

It is important to emphasise to the parents that what is most needed is adequate food and not vitamin pills or injections. It may be an advantage to withhold vitamin and iron supplement for a few days and only emphasise feeding, unless there are obvious deficiency signs. The child can be offered whatever he fancies. In the beginning the appetite may be poor and the poor mother is frantic as the child will not eat anything. She has to coax him and persuade him. At other times the appetite may be good and the child may be perpetually hungry and want to eat all the time. Some rough assessment of the dietary requirement should be made along the lines suggested (refer Chapter 3) and the aim should be to gradually increase this over a period of 2 to 3 weeks, using mainly the household diet such as rice, dal, chapati, khichri, vegetables, etc. An attempt should be made to improve the diet wherever feasible, keeping in mind the economic resources of the family. If the breast milk is very little, it is advisable to give some animal milk as well. Even 200 ml will make a great deal of difference to the nutritive value of food. While every effort must be made to encourage breast feeding, it must not become an addiction for the baby. One often sees a child sucking away at a breast which has no milk at all. He neither wants to give it up nor take anything else. In such cases it is better to discontinue breast feeding. The food portions should be gradually increased as the child's appetite improves. The food requirements should be shown to the mother as cooked food in bowls or spoonfuls, rather than as raw materials. The size of the chapati, and the dough from which it

is made, should be demonstrated because chapatis vary tremendously in size.



10.4 Marasmic child shows weight gain after adequate nutrition.

Even in very poor family, everybody eats some food, though usually not adequately. When money is spent on food some will have to be spent on the child's food also, but an effort should be made to try and get the maximum value out of the money spent. This can be done if the health workers have a sound knowledge of the prevailing dietary customs, and the price and availability of different foods in their particular region. Often a great deal of money is spent on *mosumbis*, apples, etc., when milk or egg or some other more nutritious food such as roasted groundnuts, gram, banana, mango can be bought for the same money.

The bulk of the food is a problem and the child can eat only limited food at a time, and so, small frequent feeds will have to be advised. Addition of a little oil increases the energy density of food.

Sometimes the child may pass more frequent stools because of more bulk in the gut. This usually needs no special attention and the stool pattern becomes normal in a few days time. If, however, a large quantity of milk is given, then the child may develop diarrhoea due to lactose intolerance. The quantity of milk can be reduced and more semi-solids offered instead. If the child is very young, and cannot eat enough semi-solids, then rice congee can be added to the milk to increase the energy and re-



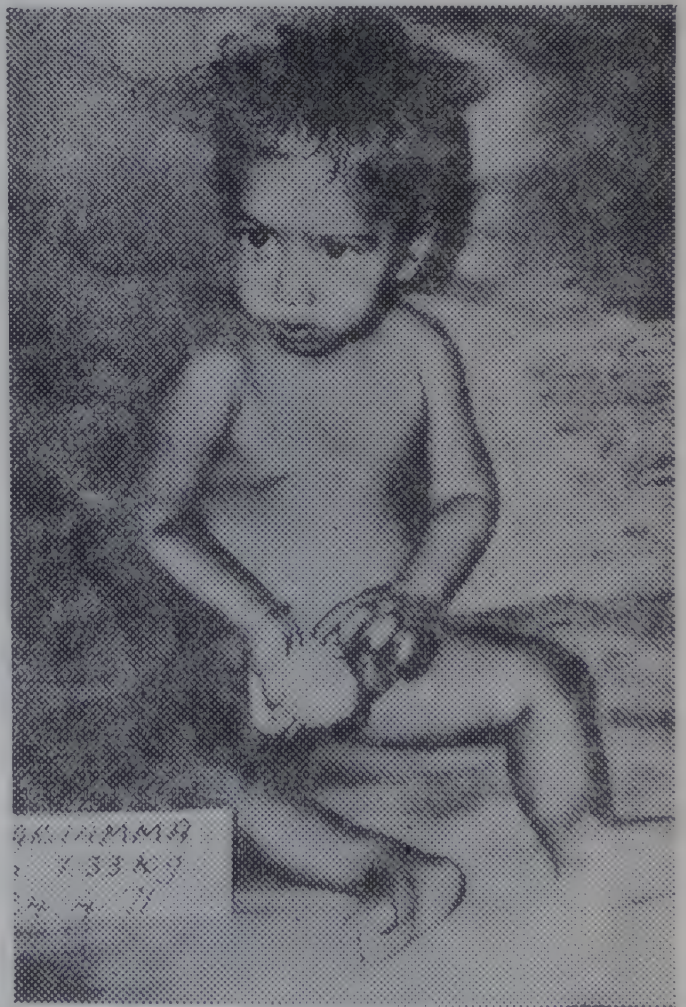
duce the lactose load. Very thin porridge of wheat or any other cereal can also be given instead of milk.

What is amazing and most impressive is not so much the weight gain, but the total change in the personality of the child when recovery begins. An apathetic disinterested child now begins to smile, respond and play. His whole facial expression changes. The child with oedema first loses his oedema and then begins to gain weight.

Severely malnourished children are prone to develop low body temperature which is harmful and may even result in death. They should be adequately clothed and kept warm.



10.5 Mariamma, a girl was with Marasmus. She weighed 3.94 kg on 7-12-1970.



10.6 After four months Mariamma weighed 7.33kg on 24-4-1971. Increase in her weight was due to the intensive feeding.

CONVINCE THE MOTHER THAT MORE FOOD  
CURES MALNUTRITION





10.7 Both these children are 27 months old. The girl on the left has not been given enough food. Lack of food permanently affects the growth of the child.

All deficiencies and infections should be adequately treated (see Chapters 11 and 12).

The management can be done at home, in a rehabilitation centre and—in severe cases—in a hospital.

### **Nutrition Rehabilitation Centres**

Nutrition rehabilitation has been tried in these centres where the mother brings the child and stays on herself to help with cooking, feeding and looking after the child. It has the advantage of the mother participating in the whole process, right from preparing the food, cooking, feeding, etc., under



the supervision of a health worker. If there is a community garden attached to the Centre, she can work in that. By her active participation, she learns the causes of malnutrition, the value of different foods and how to cook them in a clean and hygienic way with minimum wastage of different nutrients. She meets other mothers who have had similar problem with their children, and this encourages her. It is obvious, however, that the mother can only stay at the centre for a limited time every day because of her other household responsibilities and the responsibility to look after the rest of the family. With frequent home visits by the health worker and adequate supervision, the child can well be managed at home, with a visit to the nutrition rehabilitation centre, whenever necessary.

### **Hospital**

If the malnutrition is severe with complicating illnesses and the child has no appetite, or has very severe vomiting or diarrhoea, the child will have to be hospitalised. But uncomplicated PEM, even with moderate vomiting or diarrhoea, can be treated satisfactorily at home in the village or town.

### **Diet assessment**

How is a Health Worker to determine the extent of dietary deficiency in a mother or a child? This can be done in several ways:

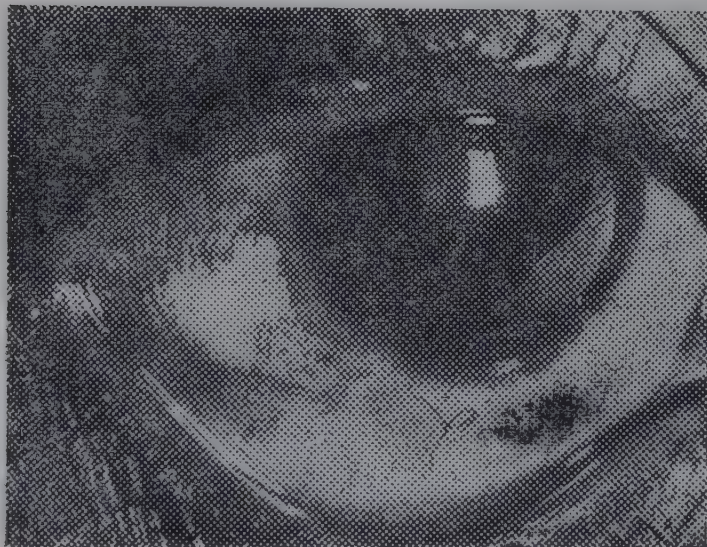
1. By questioning the mother in detail as to what she had cooked the previous day and how much exactly was eaten by each person. The mother is asked to show the amount eaten with reference to household utensils such as cups, bowls, spoons, etc.
2. By assessing the food value of cooked food by weighing the food eaten.
3. By weighing the uncooked food and then assessing the energy and proteins from the amount eaten.

All these methods, however, are prone to inaccuracies. A good rapport with the family is essential for getting correct replies to questions. The food intake may vary from day to day, and even if an adequate total amount is cooked, the mother and the young child may not get their proper share of it. Unexpected guests may tilt the balance. There is also a great deal of seasonal variation and sometimes the food pattern changes completely, particularly in agricultural communities. There are periods of plenty and periods of scarcity. □

## DEFICIENCY DISEASES

### Vitamin A

Deficiency of vitamin A is the commonest cause of blindness among children, particularly between 1 and 4 years, and is associated with protein energy malnutrition. It results from deficiency in the diet of foods containing vitamin A or its precursor, carotene, such as milk and milk products, green and yellow vegetables and fruits. Blindness may occur in infants whose mothers are deficient in vitamin A so that the foetal stores are not built up. There may be night blindness which may be difficult to detect in young children, even though the mother is usually aware of it. The conjunctiva of the eye becomes dry, wrinkled and muddy, resulting in Xerosis. Bitot's spots form on either side of the cornea, these are greyish, silvery or chalky white, dry patches on the conjunctiva on either side of the cornea. The child does not like to look at the light and keeps his eyes closed or sits or lies with his face away from the source of light. Later keratomalacia develops with the cornea becoming soft and ulcerated, leading to blindness. This change can happen very rapidly. An infection hastens and often precipitates the terminal process.



White foamy patch is the Bitot's spot.

11.1 Vitamin 'A' deficiency—Bitot's spot. The conjunctiva is wrinkled. The white foamy patch may spread on to the cornea.



### *Treatment*

Xerosis can be treated with 5000-6000 units of vitamin A daily by mouth. This is available in the form of cod liver or shark liver oil, or vitamin A drops or capsules. Eyes must be kept clean. Cloudiness of the cornea or ulceration is a medical emergency and large doses of vitamin A will be needed. WHO has recommended 200 000 I.U. of vitamin A by mouth on two successive days, to be repeated after 2 weeks. The child should be hospitalised but the initial dose of vitamin A should be given promptly by the health worker. The Government of India has started a vitamin A programme in several states where 200 000 units of vitamin A, by mouth, is given to pre-school children every 6 months as a prophylactic measure. Prescribing multivitamin drops is an inexpensive method of supplying the body needs of all the vitamins.

### *Prevention*

A diet containing plenty of vitamin A is the best method of preventing vitamin A deficiency. Breast milk is the best source in the first year. Colostrum is particularly rich in vitamin A. From the age of 4-6 months, the child should be given a variety of seasonal leafy vegetables and fruits. Children with diarrhoea, measles and other infections are in special danger of Xerophthalmia and need extra vitamin A.

### **Vitamin B<sub>1</sub> (Thiamine)**

Deficiency produces beriberi which is not often seen in India. This occurs only among populations whose main diet consists of overmilled rice. Infantile beriberi may occur if mother's diet during pregnancy and lactation has been deficient. The baby may have husky voice, rapid breathing and oedema, and develop signs of heart failure.

### *Treatment*

The treatment consists of an injection of thiamine (50 mg). If that is not possible, it may be given by mouth followed by 10 mg daily for two weeks. The most important preventive measure is to stop overmilling of rice, even though it looks more attractive than the unmilled rice. If the diet contains adequate amounts of pulses and vegetables, a deficiency of vitamin B<sub>1</sub> can be prevented. Parboiling the rice preserves vitamin B<sub>1</sub>.

### **Riboflavin**

Deficiency results in angular stomatitis. There is ulceration and fissuring at the angles of the mouth. There is cheilosis i.e. the lips are fissur-

ed vertically and they are red and swollen. The centre of the lower lip is most often affected. The tongue may be bright red in colour, smooth, bald and painful.

### **Nicotinic acid**

Deficiency leads to pellagra, in which the exposed portions of the body get skin lesions. They are always symmetrical, i.e., on both hands and both feet. The area becomes red, swollen and cracked. There is itching and a burning sensation.

#### *Treatment*

Once the clinical deficiency signs are there, a combination of the B vitamins (vitamin B complex) should be given. These are available as tablets or syrups. The diet should contain vegetables, milk, nuts, etc., which are all rich in these vitamins.

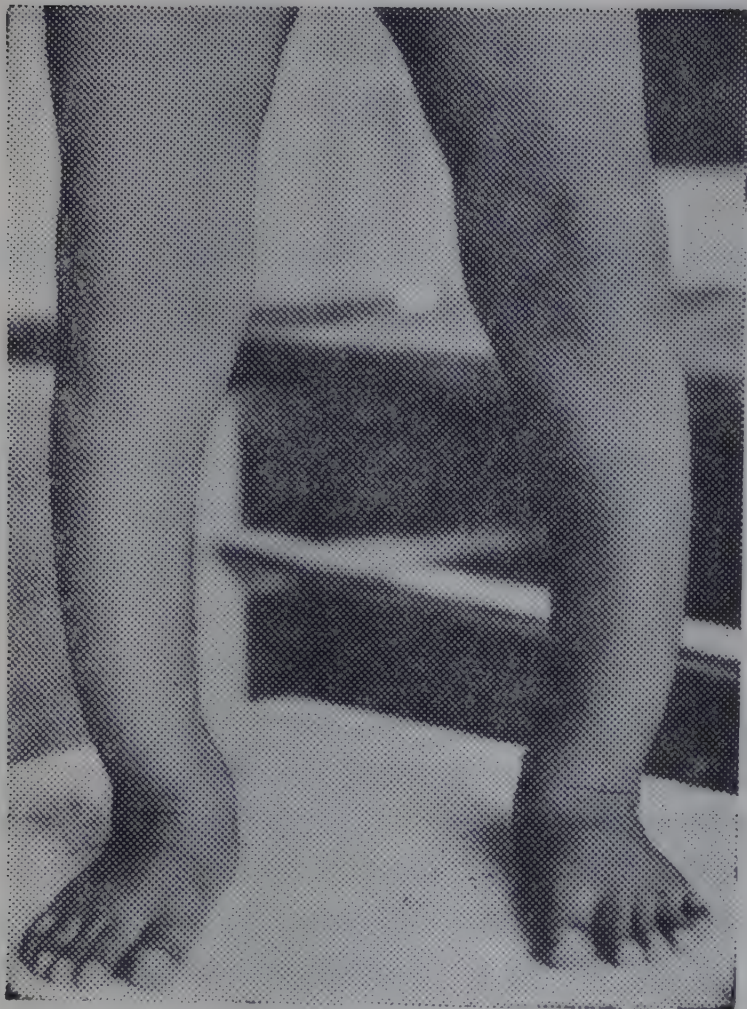
### **Vitamin C**

This deficiency (scurvy) is not seen in breast-fed babies because the baby gets adequate supply of this vitamin in breast milk. Cow's or buffalo's milk, after it is boiled, has no vitamin C. Cooking destroys vitamin C in vegetables. Fortunately the body needs of this vitamin are small and the deficiency is not often seen. Raw onions, raw mangoes, green chillies, curry leaves and chutney prepared from coriander and mint leaves and occasional fruit probably supply the minimum needs required. The symptoms are marked irritability, tenderness of bones, spongy, bleeding gums and tendency to bleed into the skin or under the periosteum. Vitamin C, 200-300 mg a day by mouth, will result in rapid improvement. The diet should contain some foods rich in vitamin C like vegetables, citrus fruits, tomatoes, amla, guava, etc. It may be cheaper to supply this vitamin as a tablet rather than in food.

### **Vitamin D**

Deficiency results in rickets. There is enlargement at the ends of the long bones, particularly at the wrist and ankle. There are rounded projections on the ribs on both sides of the chest, and this is referred to as a rickety rosary. The bones are soft and bend under pressure of walking or standing. The knees touch each other and the forelegs diverge from the knees (knock-knee), or there may be bowing of both the thigh bones as well as the lower leg bones. The muscle tone is reduced and the child cannot sit, crawl or walk. In female children, deficiency may cause deformity of the pelvis which will interfere in the normal delivery of the baby at a later date.





11.2 Ricket develops bo-  
wing of the legs.



11.3 Ricket widens the  
wrist.



Most foods are very poor in this vitamin. The main source is sunlight which converts the provitamin into vitamin D. Adequate intake of calcium and phosphorus is necessary for this. The intake may be low and repeated diarrhoea may result in inadequate absorption from the intestines. Phytic acid in cereals also prevents absorption of calcium.

With experience it is not difficult to diagnose rickets, but in doubtful cases an X-ray of the wrist may be necessary.

### *Treatment*

Vitamin D can be given by a massive dose of 600 000 units, either by mouth or as an intramuscular injection, followed by 1000 units a day till healing occurs in 3 to 4 months. Prophylactic dose is 400-500 units a day.

### **Anaemia**

This is mainly due to iron deficiency but folic acid (aB vitamin) and vitamin B<sub>12</sub> deficiency also may play a part. The child looks pale, his conjunctiva, lips, tongue and under-nails are pale. The nails may become flat or spoon-shaped. The anaemia may be due to lack of iron in the diet, lack of absorption from the gut, or hookworm infestation. It may also be seen in infancy under the age of 6 months as a result of inadequate iron stores in the liver because of anaemia in the mother or due to premature birth. The severity of anaemia can be assessed by doing the haemoglobin estimation. A simple but reliable method has to be used in the field. Health workers can also be taught to identify anaemia by comparing the coloured picture of an anaemic and normal person.

### *Treatment*

Hookworms should be treated (refer page 88) and a suitable preparation of iron given. Ferrous sulphate is as good as any other more expensive salt. One tablet of 200 mg, containing 40 mg of elemental iron, is enough for a child up to 5 years. Because of widespread anaemia, it is better to give iron as a prophylactic; 10 mg of elemental iron in the first year and 20 mg after that. The tablets issued by Government, containing 20 mg elemental iron and 0.5 mg folic acid, are very convenient, and 1 tablet a day is a good prophylactic as well as treatment for milder anaemia.

Anaemia is very common in pregnant women. It is recommended that a pregnant woman should be given 60 mg of elemental iron and 0.5 mg of folic acid a day during the last 100 days of her pregnancy. Foods rich in iron like meats and green vegetables should, if possible, be added to the diet.



The possibility of fortifying some articles of food with iron has engaged the attention of nutrition research workers for some time. Fortified iron salt may be available in the not too distant future.

### **Iodine deficiency**

Endemic goitre and cretinism due to iodine deficiency are widely prevalent in India. The endemic belt covers the Himalayan foot hills from Kashmir in the west to the Naga Hills in the east. It involves the states of Kashmir, Himachal Pradesh, Punjab, Haryana, Uttar Pradesh, Bihar, West Bengal, Sikkim, Assam, Mizoram, Meghalaya, Tripura, Manipur, Nagaland and Arunachal Pradesh. It also includes the hilly tracts of Madhya Pradesh, Rajasthan, parts of Andhra Pradesh, Maharashtra, Gujarat and Kerala and Delhi. About 120 million people live in the known goitre endemic regions. About 40 million of these are afflicted with goitre.

Large-sized goitre with nodules, is the most frequently encountered effect of iodine deficiency resulting in deficiency of thyroid secretion. The surveys have shown that 4-15 per cent babies have neonatal hypothyroidism which if untreated results in deaf-mutism and mental retardation. Injection of iodinated oil to pregnant women can prevent neonatal hypothyroidism. Use of iodized salt can prevent goitre and iodine deficiency, and efforts are being made to make iodized salt available in the goitrous regions.

### *Treatment*

Simple goitre responds well to small doses of potassium iodide (60 mg daily) with 0.1 mg of thyroxine three times a day.

Any baby born of an untreated mother with goitre should be referred to a hospital for assessment. □

## INFECTIONS

Repeated infections are very common in underprivileged children. The child may have diarrhoea, and while he is recovering from it, he might get fever and cough and little later, boils, and then diarrhoea again. Unless immunized, he will also develop measles and whooping cough. These infections have an adverse effect on nutrition and, once the child is malnourished, he falls ill more often and the infections are more severe. Appetite becomes poor due to illness and the parents also stop most food due to ignorance and only give tea, rice water, whey, barley water, etc. This further affects the nutrition adversely. Measles is often complicated by pneumonia and diarrhoea and this along with malnutrition often results in death. Due to ignorance, some parents brand the child in the upper abdomen (burning 5 spots near the epigastrium) in the belief that this is a treatment of the child's ailment. It is a cruel and a painful procedure often resulting in infection of the burnt spots.

Of all infections in infancy and childhood, diarrhoea and respiratory diseases are the commonest and cause the largest number of deaths.

### Diarrhoea

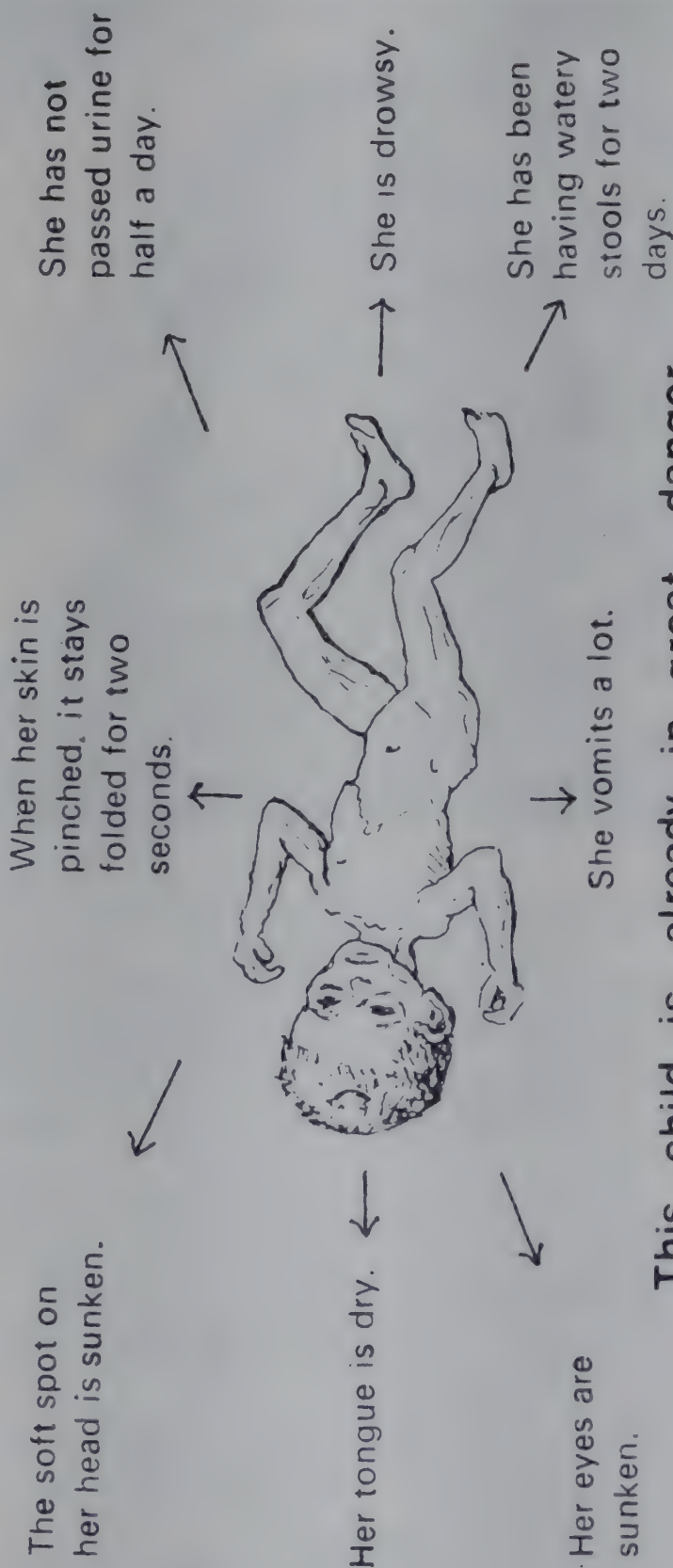
Diarrhoea means increased frequency of stools which may be watery or may contain blood or mucus. The frequency is not so important as the bulk and the amount of water passed with each stool. Diarrhoea is a very serious disease and is the commonest cause of death. One out of every 20 children born in the developing world dies of diarrhoea dehydration before reaching the age of five years.

The breast-fed baby has 5 to 6 semi-formed stools a day, usually after a feed. This is a normal pattern and should not be considered as diarrhoea. The baby continues to take his feeds well and to gain weight.

Diarrhoeal disorders are rare in breast-fed babies but are common in artificially fed babies. The reasons for this are poor environmental sanitation, flies, unhygienic methods of handling food, unsafe drinking water and maternal ignorance. Milk is an excellent medium for growth of orga-



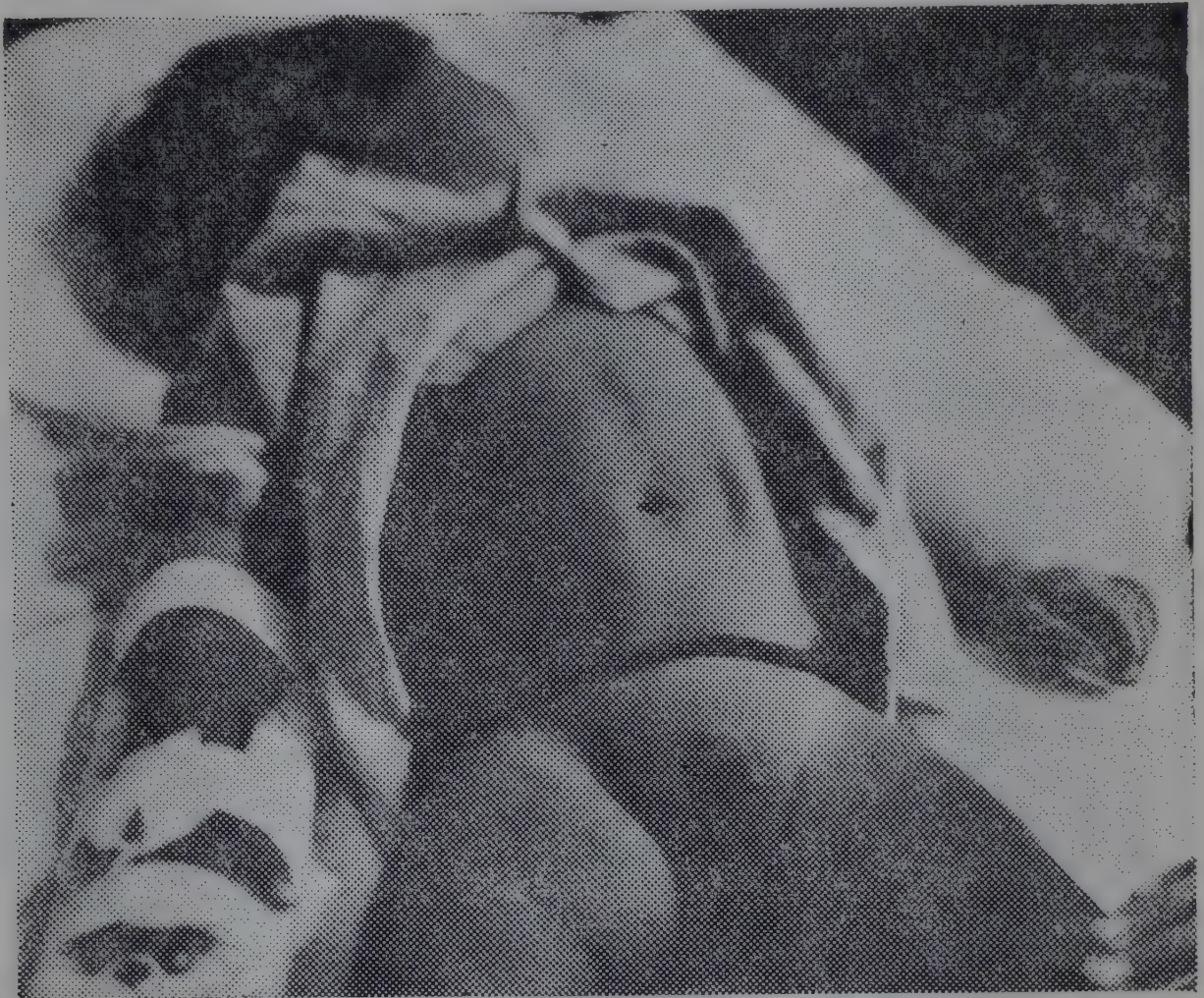
# This child has diarrhoea and is seriously ill



**This child is already in great danger**

Don't wait for all these things to happen.  
 Start treatment early.  
 Take her to the health centre if she does not get better.





12.1 A Child with dehydration is in danger.

nisms, and so, diarrhoea is common when bottle hygiene is poor. As mentioned earlier (see Chapter 4), the breast-fed baby is also protected because breast milk produces a lacto-bacillus in the gut which inhibits the growth of *E. coli*, one of the commonest causes of diarrhoea in infancy.

### **Causes of diarrhoea**

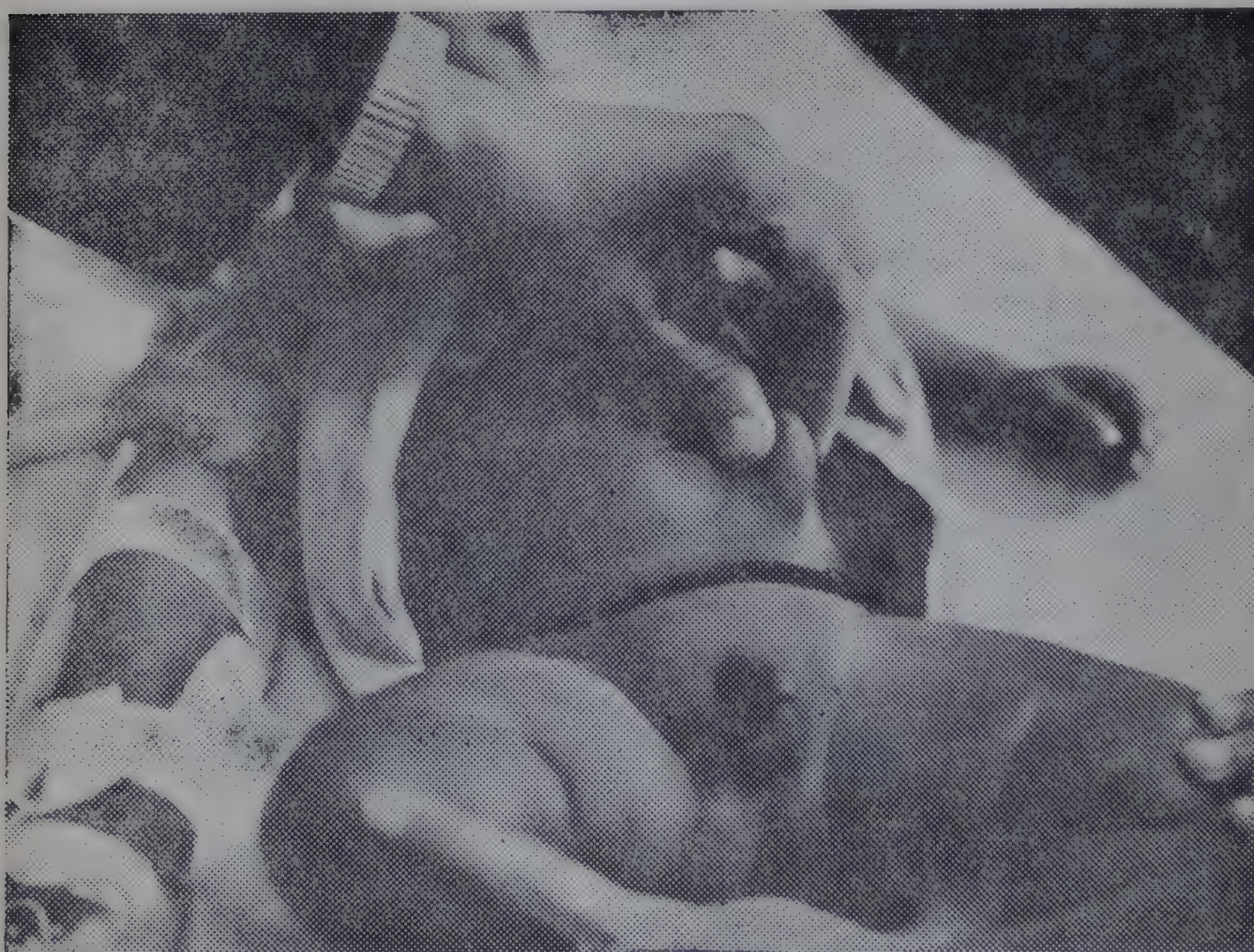
1. Intestinal infections due to bacteria and viruses.
2. Parasites like *Giardia lamblia* and *E. histolytica* (the latter not in infancy).
3. Infections outside the intestine, e.g., ear infection, tonsillitis, measles, pneumonia, etc.
4. Malnutrition itself may cause diarrhoea, due to poor digestion and poor absorption of food. Absorption may be poor because of a paper thin gut wall, intestinal hurry and deficiency of pancreatic enzymes. Usually malnutrition and infection are found together. Starvation may result in repeated passage of green mucousy stools.



The importance of a clean environment must be explained to the family. The refuse should be kept in a covered bin, and the food should be protected from flies. A simple device is to hang a bamboo chick on the door or, cheaper still, to make a curtain out of an old sari. This will help to keep the flies out. Drinking water for the baby should be boiled, at least for the first year. The mother should be taught the difference between the municipal tap water and deep well water (which are safe) and the shallow well, or the pond water, which is unsafe. In urban areas, unfiltered water provided for the garden is not safe for drinking. Stored water should be kept in covered pots and taken out with a mug with a long handle so that the hands do not touch the water. Frequent hand washing is a good way of keeping the infection out, but this can only be done if plenty of water is available, either in the house or nearby.

### *Management of diarrhoea*

Since the child is losing a great deal of water both in stool and sometimes in vomit, this has to be replaced to prevent dehydration. All health workers—indeed all mothers—must learn to recognise the signs and symptoms of dehydration. The tongue and lips become dry and the child is



12.2 A child with dehydration will have loss of elasticity.



very thirsty. The eyes seem to become rather hollow and the anterior fontanelle becomes depressed. The child is restless and is quietened when water is given to him. Later the skin becomes inelastic and, when pulled up, does not go back to its original shape quickly. If the losses from the body continue, the condition becomes more serious as urine becomes concentrated and reduced in volume and cold, clammy sweats develop. The child should be given adequate fluids in the early stages, so that severe dehydration does not develop. Severe dehydration is dangerous and can cause death.

DEHYDRATION		
Sign	Mild	Severe
(1) Patient's appearance	Alert or restless Thirsty	Limp or unconscious Too weak to drink fluids. Cold skin (shock).
(2) Mouth	Normal	Dry
(3) Skin elasticity	Normal or slightly, less than normal	Poor
(4) Eyes, fontanelle	Normal or slightly sunken	Sunken
(5) Radial pulse (at the wrist)	Good volume, rate 120-140 pm	Weak or absent; rate over 140 pm
(6) Urine flow (difficult to tell in children)	Normal	Little or none
Amount of fluid lost when these signs are present	50 ml for each kilogram of body weight	100 ml or more for each kilogram of body weight

### Oral rehydration

Most children with diarrhoea can be managed by giving fluids by mouth. A rational management is as follows:-

- (a) To prevent dehydration using solutions prepared from ingredients commonly found in the home.
- (b) To correct dehydration using a balanced glucose-salt solution. (ORS) recommended by WHO and UNICEF.

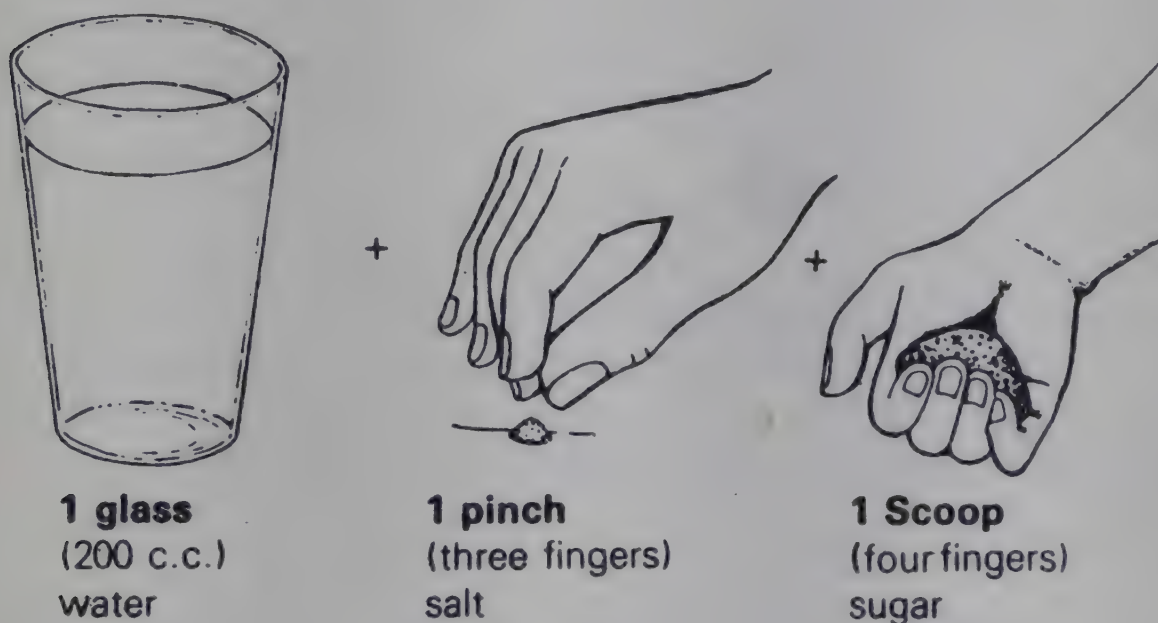
### Prevention of dehydration

Any fluid available at home or easily made can be used e.g. rice water, dal water, weak tea, lemon in water with sugar and a pinch of salt (nimbu pani), green coconut water etc.



A simple salt and sugar solution can be made at home using sugar or gur and salt in water. Various measures have been used by different people. One level teaspoon of salt (3-3.5 g) and 6-8 level teaspoons of sugar (20-30 g) can be dissolved in one litre of water to make the right solution.

Salt can also be measured by a three finger pinch. 3-4 pinches will measure 3 g of salt. Sugar can be measured with a four finger scoop (20-25 g).



### 12.3 Use this formula to prepare the household salt and sugar solution.

Different sizes of plastic spoons for measuring sugar and salt are available from TALC (Teaching Aids at Low Cost), London and from VHAI (Voluntary Health Association of India), New Delhi.

Measurement of 1 litre of water too poses a problem. Many households may not have a 1 litre vessel. One household cup or glass measures 200 ml and so 5 glasses will make a litre. The common sherbat bottle can also be used to measure. One and a half bottles will measure one litre.

Too much salt can be dangerous. So the mother should be taught to taste the salt and water solution before adding sugar. It should be no saltier than the taste of tears.

### Treatment of dehydration

For the treatment of dehydration, oral rehydration glucose salts solution (ORS) has advantages over the household fluids, but till the ORS packet is available, household fluids must be given in adequate amount.

ORS solution can be used in dehydration from diarrhoea of any cause including cholera.

Packets of balanced glucose-salts (ORS) are being manufactured in India and are also available through WHO and UNICEF. If this packet is handy at home, it should be dissolved in 1 litre of clean water and the fluid given to the child. A fresh solution should be made every 12-24 hours. The solution once made *should not be boiled*.

The packet contains:

Sodium Chloride	3.5 g
Sodium Bicarbonate	2.5 g
Potassium Chloride	1.5 g
Glucose	20.0 g

These packets are being made with the help of the community in some places. The ingredients are weighed and packed in polythene bags. This helps to reduce the cost considerably. Besides, the involvement of the community in their own health problems has great advantage.

#### How much fluid to give

Child's thirst is a very good guide. As long as he is thirsty and drinks fluid happily, he needs fluid. Mother should be advised to give a small quantity of fluid at a time—3 or 4 teaspoons or 1 or 2 mouthfuls from the cup or glass every few minutes. This will prevent vomiting. The child will need about 200 ml or 1 glass of fluid every hour. Another way is to advise the mother to give 1 glass (200 ml) of fluid after each stool. Once his dehydration is better, the amount can be reduced. In moderate diarrhoea (5-6 stools a day) he will need 1 litre fluid per day.

Fluids must be continued until all signs of dehydration have disappeared. Patients with severe continuing diarrhoea may need 2 litres or more of fluid in 24 hours.

Mother must be advised to keep a careful count of how many glasses or cups of fluid she has given to the child.

There may be situations when ORS packet is just not available. There is no cause for despair. The household salt and sugar solution can be continued as long as necessary. Potassium can be provided in the form of lemon juice added to the solution or by giving banana which is rich in potassium.

Ground rice boiled into a thin soup can be given with a pinch of salt. Other cereals, all of which contain the necessary glucose, could be used in the same way.



If diarrhoea persists, or there is vomiting, then intravenous sterile fluids will have to be given. This can be conveniently done by inserting into any of the peripheral veins a thin needle or a scalp vein needle. This has a "shoulder" which fits well into the flat surface of the arm, back of the hand or ankle. A useful simple solution is 1/2 normal saline in 5 per cent glucose, and is effective in most cases.

The quantities to be given can be calculated as follows:-

1. Moderate dehydration; 100 ml per kg in 8 hours.
2. Severe dehydration; 150 ml per kg in 8 hours. A quarter of the fluid calculated can be given in the first hour.

This is the deficit therapy i.e. replacement of the fluid that the child has lost. In the remaining 16 hours of the day the maintenance fluids would have to be given. A convenient method of calculating the rate is:

$$\text{ml per hour}/3 = \text{no. of drops per minute.}$$

It must be remembered that with care and patience most children can be given the fluids by mouth, and intravenous fluids may not have to be used. But if the child does not accept oral fluids, or is vomiting, then intravenous fluids should be given without delay.

Most of these children are malnourished, and it is important to start feeding them as soon as possible. If breast milk is available, that is the best; otherwise a half-diluted milk formula with added sugar can be given. The amount should gradually be increased to satisfy hunger and energy requirements and the dilution should gradually be reduced. In 4 to 6 days' time the child should be taking his full requirement of milk. Rice congee can be given both for hydration and energy. Semisolids should be gradually started. The older child should gradually start eating his normal food as soon as the stools return to normal, keeping the fibre and the roughage low for a few days.

If the stools increase when milk is fed, and are large, pale, frothy and sour smelling, then the child in all probability has lactose intolerance. In such cases, the child can be given concentrated rice congee, curds or soya-bean milk for a few days and milk can be gradually introduced. The intolerance usually lasts only a few days.

Undernourished children are very prone to get hypothermia or low body temperature and, even in a mild climate, may need to be covered with a sheet, and have some extra clothing.

Most causes of diarrhoea are self limiting and therefore drugs have no role in the management of uncomplicated diarrhoea. However, they still

continue to be used. Their use may be considered in a severely ill-child who has fever or is severely malnourished. This should be done under doctor's advice. Binding agents such as kaolin and pectin have no role to play. Drugs such as lomotil can be dangerous and should not be used.

### **Bacillary dysentery**

The child complains of abdominal pain, and the stools contain plenty of mucus and blood and very little faecal matter. Sometimes there is high fever and associated shock.

#### *Treatment*

Sulphonamides (150 mg per kg) can be tried initially, but if there is no response, furoxone (5 mg per kg) or chloramphenicol (50 mg per kg) should be given. Ampicillin (50 mg per kg) can also be given. A doctor should be consulted if there is no response in 2 days.

### **Treatment of giardiasis**

Giardiasis can lead to chronic diarrhoea and sometimes to malabsorption, and should be treated: Furoxone (5 mg per kg weight) for a week, or Metronidazole (15 mg per kg weight) for 5 days. The course may have to be repeated if infection persists.

### **Treatment of *E. histolytica* infection**

This should be undertaken under medical advice, as there are several drugs with different doses, etc.

The diagnosis of these conditions can be confirmed where this is practicable by the microscopic examination of the stool. The stool sample should be as fresh as possible, particularly for the diagnosis of *E. histolytica* because the protozoal forms are destroyed quickly.

### **Acute respiratory infections**

Respiratory infections, together with diarrhoea, are the commonest cause of morbidity and mortality in childhood. The simplest form is the common cold which, if mild, does not need any treatment. It can become a problem in breast-fed or bottle-fed babies because the baby cannot suck with his nose blocked and he is using his mouth for breathing. In babies with more severe forms of cold, symptomatic treatment in the form of steam inhalations and Ephedrine nose drops, 1/2 per cent in saline, may be used 3 to 4 times a day. If cough is associated with the cold, some cough sedative may be given. Traditional household remedies like honey in hot water and decoctions of Tulsi and Banafsha are helpful. Boiling water in a kettle



can be used for steam inhalations. The baby sits on the mother's lap, close to the kettle. A sheet or a towel is used for covering both the baby's and the mother's head, so that the steam can be concentrated under it and inhaled. Five to ten minutes at a time is sufficient.

In more severe cases, there may be moderate to high fever, cough, restlessness and rapid respiration. There may be involvement of air passages or the lungs, resulting in pneumonia. This is serious and is an important cause of death—almost as much as diarrhoea is. The condition should be recognised by the family and the health worker as prompt treatment is essential. Rapid breathing and/or indrawing of lower part of chest are danger signs and immediate treatment is indicated.

### *Treatment*

CoTrimoxazole (Septran) 6 mg per kg for 5-7 days or oral penicillin.

### **Whooping cough**

This commonly occurs under the age of 5 to 6 years, and is more serious if the child is young. The infant has no inherited immunity against it. The disease lasts several weeks with prolonged bouts of cough, usually ending in a whoop. It results in severe malnutrition due to frequent vomiting and inadequate food intake. Due to the thick mucus secretions, the respiratory passages get blocked and this results in several kinds of lung complications.

The treatment consists of symptomatic relief of cough with a cough suppressant, increased humidity, sips of warm drinks, etc., and the use of antibiotics in case of complications. There is some evidence that the use of chloramphenicol, erythromycin or ampicillin in the early catarrhal stage may reduce the length of the disease.

Babies less than a year old seldom whoop. Instead, they have spasm of coughing, stop breathing for a minute or so, become blue, and then vomit. A baby may die in one of these attacks. The disease is particularly serious in infants less than six months old. As soon as the disease is suspected, chloramphenicol, erythromycin or ampicillin should be given.

Whooping cough can be prevented by 3 doses of whooping cough vaccine which is available in combination with diphtheria and tetanus toxoid (triple antigen or DPT). (See Chapter 13).

### **Measles**

This, too, is most common in children under the age of 5 years and many children get it before they are 3 years old. The baby has some immu-

nity for the first 5 or 6 months of life. The disease can be very serious in young malnourished children and may lead to further loss of weight and result in severe forms of protein energy malnutrition. It can lead to pneumonia, diarrhoea, ear discharge, prolonged debility, etc. Some children who had been walking before they got measles, go off their feet for months. Measles and diarrhoea appear to interact synergistically to increase mortality. In some studies measles has emerged as the single most important cause of death with diarrhoea as the most common complication.

Measles can be prevented by giving measles vaccine, and government is giving serious thought to including it in the expanded programme of immunization on a countrywide basis.

### **Worm infestation**

The commonest worms are roundworms (*Ascaris lumbricoides*), hookworms (*Ankylostoma duodenale*) and threadworms (*Oxyuris vermicularis*).

### **Roundworms**

Roundworms are acquired as a result of poor hygiene, improper disposal of sewage, impure water and contaminated vegetables. When stools are passed in the open, the ova of the worms develop into larvae and are ingested along with contaminated water, or unwashed root vegetables. Some children acquire the infection through the habit of eating mud. The child initially is very hungry, but later loses appetite, becomes listless and may develop a protruberant abdomen. A roundworm eats about 0.1 g of protein per day from the intestines. If the worms are in very large numbers and form bunches, the child may develop acute intestinal obstruction with acute colicky abdominal pain and vomiting. However, the common assumption that all abdominal pain in children is due to worms is not true. There is no truth in the belief that roundworms produce convulsions in children. The worms may be passed in stools and sometimes may be vomited out.

### **Treatment**

Piperazine, 1/2 g for each year of the child's life (i.e. 2.5 g for a 5-year old), may be given at bedtime as a single dose. The child will pass the worms the next day. The treatment may be repeated after a week if the infestation is heavy. Levamisole 50 mg as a single dose can also be given.

### **Hookworms**

This is a serious problem because the worms suck blood from the upper intestines, and this results in iron deficiency anaemia. The infection



is acquired from walking barefoot and the larvae in the soil that have hatched from the ova passed in the stool, penetrate the skin and enter the body. The most important public health measure is adequate and proper disposal of sewage. Wearing shoes is impracticable in rural areas because of the type of work the villagers do, which is mainly agricultural, and also because of the cost involved.

*Treatment*

Bephenium hydroxynaphtholate is given as a single dose in some sweet drink because of the bitter taste. The dose for a child under 2 years is 2.5 g , and for a child over 2 years is 5 g.

**Threadworms**

These are more a nuisance value than anything else. The only symptoms they cause is local irritation of the anus and itching of the vulva in girls.

*Treatment*

Piperazine is the method of choice along with a local soothing ointment. Nails must be cut short and the hands should be washed thoroughly before eating food. The dose of piperazine varies with body weight as follows:-

Weight	Dose
Up to 7 kg	250 mg
7-14 kg	500 mg
15-27 kg	1 g
Over 27 kg	2 g

This is given once a day for seven days before the morning meal.

Usually most members of the family have the infection and so everyone should be treated at the same time.

**Skin infections**

*Scabies*

This may affect the whole family because it spreads by direct contact from one person to another. There is generalised itching and later small pin-head size vesicles develop on the webs of the fingers and the wrist and spread to other parts of the body. Because of the itching the skin is scratched and this results in ulceration and crusting. The face is spared, but in infants the lesions spread quickly and involve the whole body, including the face.

### *Treatment*

Treatment consists of applying benzyl benzoate emulsion 25 per cent to the whole body for 3 to 4 days after a bath. If that is not available, 5 per cent sulphur ointment can be used but it may give rise to itching and irritation of the skin. The clothes also start smelling of sulphur.

### **Pyoderma**

This includes pimples, boils and pustules. Some local application like gentian violet 1 per cent, or cetavlon cream, is helpful. In severe cases, an antibiotic such as penicillin may have to be given. Importance of bathing and cleanliness should be emphasised. Crusts should be removed with 5% copper sulphate solution or with a cotton swab soaked in cetavlon lotion. The lesions can be soaked in hypochlorite or permanganate solution or saline for ten minutes two or three times a day. Hypochlorite solution can be made by adding 1 teaspoon of calcium hypochlorite to a litre of water. The permanganate solution can be made by putting a three finger pinch of the crystals into half a bucket of water. The infected hand or foot should be soaked in the bucket. Saline solution can be made by adding half a level teaspoon of salt to a cup of water. Gentian violet or an antibiotic ointment can then be applied after drying the skin.

### **Sore eyes**

These are very common and are a result of unhygienic conditions, dust, flies, etc. The eyes are red and itchy and there is a watery discharge, which later becomes like pus. The eyes should be washed repeatedly with clean water, and sulphacetamide drops, 5-10 per cent, put into the eyes 3 to 4 times a day till the infection has been cured.

### **Fevers**

Most of the fevers are caused by a virus. They last for 3 to 4 days and may be accompanied by a cough or cold. Aspirin (65 mg per kg per day, or 60 mg per year of child's age per dose) or paracetamol (125-250 mg, 2 to 3 times a day) may be given. Keeping the child cool and sponging his body with a wet towel, and then drying it, also brings down the fever. Merely keeping a wet cloth on the forehead is not enough—unless more body surface is cooled, the fever will not come down.

### *Malaria*

Malaria is another cause of fever. It is more common in the rainy season when the anopheles mosquitoes breed. There is usually fever with rigor and shivering on alternate days, but at times the fever comes on daily



or may even be continuous. The liver and spleen become enlarged. The disease is confirmed by finding the malarial parasites in the blood slide made from a finger prick.

### *Treatment*

Dosage schedule is given in the National Malaria Eradication Programme.

On the first day, chloroquin or camaquin is given in the recommended dose, followed by primaquin for 5 days.

Age group	Chloroquin (150 mg tab)	Camaquin (200 mg tab)	Primaquin (2.5 mg tab)
Upto 1 year	$\frac{1}{2}$ tab	$\frac{1}{2}$ tab	—————
1 to 4 years	1 tab	$\frac{3}{4}$ tab	1 tab x 5 days
4 to 8 years	3 tab	$2\frac{1}{2}$ tab	2 tab x 5 days
8 to 14 years	3 tab	$1\frac{1}{2}$ tab	4 tab x 5 days
Adults	4 tab	3 tab	6 tab x 5 days

Another treatment schedule is chloroquin 10 mg per kg followed by 5 mg per kg after 6 hours and for 2 days after that (total of 25 mg per kg). In the absence of primaquin, prophylaxis dosage should be continued once a week.

### *Prophylaxis of malaria*

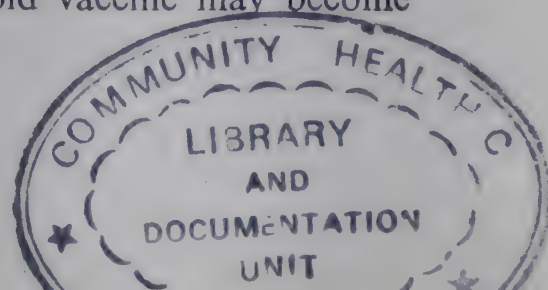
Chloroquin is recommended in the following doses once a week.

Up to 1 year— $\frac{1}{4}$  tab; 1-2 years— $\frac{1}{2}$  tab; 2-6 years— $\frac{3}{4}$  tab;  
6-12 years—1 tab; above 12 years—2 tabs.

### *Typhoid*

This is one of the commonest fevers, more common in summer but occurs throughout the year. It can lead to prolonged illness and severe complications, particularly in malnourished children. The severe cases have to be admitted to hospital. Danger signs are distension and pain in the abdomen, bleeding from the rectum and alteration of consciousness. Specific treatment is chloramphenicol 50 mg per kg which should be administered under doctor's advice. The disease can be prevented by immunization with typhoid vaccine. A new oral typhoid vaccine may become available in the near future.

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### Diet during fevers

Most mothers think that the child should not be given food during fever. All solid food is withheld and wheat and other cereals are considered dangerous. The child is given only rice water or barley water, milk or fruit juice. A lot of money is wasted on fruits like apple, grapes or pomegranate (bedana anar). Rice is sometimes allowed in the form of khichri.

If the child's appetite is poor, which often happens during illness, then he should be given frequent feeds of milk and semi-solids like porridge, khichri, soft rice, dal, etc. But the trouble frequently is that the child is longing to eat but the mother withholds all food in the belief that it is bad for him. The child should be encouraged to eat everything. Actually his energy requirements are *greater* during fever. If he is disinclined to chew the food it can be made soft for him so that he can swallow it easily. Adequate water or other fluids should be given to counteract the dehydrating effect of fever. Often the child does not suffer so much due to the illness as due to the starvation that so often accompanies it, especially if the fever is a prolonged one. The beliefs about withholding food are particularly deep-rooted with regard to typhoid fever. There is no harm in giving solid food to a child with typhoid. He can be given rice and chappati or anything else he may wish to eat. Non-vegetarians can eat eggs, fish and meat. □



IMMUNIZATION

As has been stressed before, malnutrition and infection are interrelated. Infections are more serious in malnourished children and may lead to prolonged ill health, loss of weight and even death. It is important, therefore, that health workers should know about immunization procedures, the different kinds of vaccines and the diseases that can be prevented by immunization. Under the Expanded Programme of Immunization (EPI), six diseases are covered by immunization—tuberculosis, diphtheria, whooping cough, tetanus, poliomyelitis and measles.

THE AIM SHOULD BE TO COMPLETE THE IMMUNIZATION AS SOON AS POSSIBLE AND CERTAINLY WITHIN THE FIRST YEAR.

Unfortunately the EPI coverage is still very low. The coverage for 1982 was—DPT (3 doses) 35%, Polio (3 doses) 11%, BCG 14% and TT (2 doses) 25%. Every effort must be made to improve the situation, and mothers and young children should be immunized wherever they are. The following schedule is recommended by the Government of India.

Immunization schedule		
3—9 months	—Triple antigen (DPT)	: 3 doses
	Polio	3 doses
		} at monthly interval
	BCG	: 1 dose
9—12 months	—Measles	: 1 dose
1½—2 years	—DPT	: 1st booster
	Polio	1st booster (4th dose)
School entry (5 years)	—DT	: 2nd booster
	Polio	2nd booster (5th dose)
10 years	—Typhoid	: 2 doses
	Tetanus toxoid	} at monthly interval
Pregnant women	—TT	: 2 doses at monthly interval.

*Note*

At 5 years DT (Diphtheria and tetanus toxoid) is preferred to DPT. Pertussis component is not necessary at that age and may result in adverse reactions.

BCG gives better protection if given around 3 months of age. But if the mother delivers at the hospital and it is doubtful whether she will bring the baby for BCG later, it should be given soon after birth. While the time range for DPT and Polio vaccine is 3-9 months, the aim should be to complete the three doses as early possible within that period.

For various reasons, it may not be possible to give DPT as scheduled. If the gap between one injection and the next is as long as even 4 to 5 months, the course does not have to be started all over again. The balance of the injections can be given.

**BCG**

This protects against tuberculosis. The vaccine is given intradermally in the left shoulder. For 4 to 6 weeks there is no sign of a lesion, but after that a "pimple" develops which discharges every now and then. It heals in 10 to 12 weeks leaving a small scar.

**DPT**

This protects against diphtheria, whooping cough and tetanus. The vaccine is given intramuscularly on the outer side of the thigh. There is pain for a day or so which can be relieved with aspirin or paracetamol.

**Measles vaccine**

This is given between 9 and 12 months. After 5-7 days, there is mild fever and even a mild rash which may last for a day or two. The immunity is life-long.

**Tetanus toxoid to the pregnant mother**

Every mother should be given at least 2 doses of tetanus toxoid at 1 month interval, to protect against maternal and neonatal tetanus. The second dose has to be completed at least one month before delivery. It is estimated that 1.5 to 2 lakh babies die every year due to neonatal tetanus.

**Points to remember**

Health workers should use every opportunity to immunize eligible children. It is particularly important to immunize children with malnutrition.



Low grade fever, mild respiratory infections or diarrhoea, and other minor illness should not be considered as contraindications to immunization. If the child has a temperature above 101°F, the immunization should be deferred. A second or third DPT injection should not be given to a child who has suffered severe adverse reaction to the previous dose particularly a convulsion. The pertussis component should be omitted and diphtheria and tetanus immunization only should be given.

Oral polio vaccine can be given to a child with diarrhoea, but an additional dose should be given as soon as the child is seen again.

### **Types of vaccines**

BCG and measles vaccines are freeze-dried and should be reconstituted just before use and used up within 6 hours. They are reconstituted with distilled water. Polio vaccine is a live, attenuated oral vaccine. Refrigeration is required for all vaccines. The most delicate is the polio vaccine and is rapidly destroyed unless storage conditions are strictly adhered to. Even during administration at a clinic, polio vaccine must be kept in ice in a thermos flask or in a special cold box which are being provided under EPI.

As mentioned in Chapter 12, (Page 98). Government is giving serious thought to including measles vaccine in EPI on a countrywide basis.

The Central Drug Research Institute at Kasauli is now manufacturing concentrated typhoid vaccine which can be given intradermally in doses of 0.1 ml. The reactions with this are minimal. An oral vaccine is under trial by WHO and may be available soon. □

## THE UNDER-5 CLINIC

### The concept

As has been repeatedly emphasised, the problems of malnutrition and infections are commonest in the first five years of life and particularly in the first three years. Prolonged malnutrition may affect the child's growth, and he may not be able to reach his optimum potential. In a child care programme, it is essential to combine the assessment of nutrition and growth with immunization, treatment of illness and advice on Family Planning. The concept of an Under-5 Clinic comprises all these aspects and is now widely accepted as a good way of health delivery, better than the old fashioned Well Baby Clinics or the out-patients department where only the illness is treated and no emphasis is given to nutrition assessment and advice, immunization, child spacing etc.

The essential features of an under-5 card are the same, even though there are some local variations.

### Main features of the under-5 card

1. Record of weight for age
2. Assessment of nutrition and relevant nutrition advice
3. Immunization to the healthy as well as malnourished children
4. Family planning advice
5. Treatment of illness.

### The use of the card

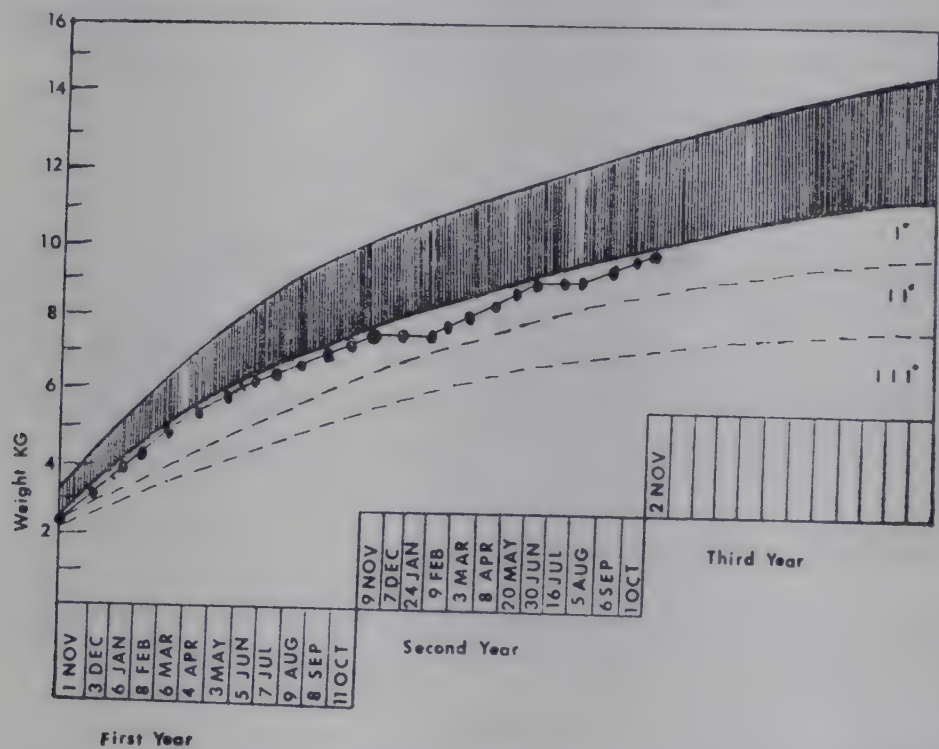
The child's age is recorded using a calendar which starts with the month of birth and is followed by all the months for the first five years. Often a local events calendar has to be used to determine the month of the birth. Illiterate rural people will remember the festivals, family events, national holidays, etc., and with a little effort and care, accurate assessment of the age can be made.\*

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\* See the Indigenous Calander in the Appendix-7



Depending on the weight, nutrition advice can be given, and the significance of the weight explained to the mother. The card can thus act as an education tool for the mother. There are appropriate columns for recording immunization. The family size and the number of children alive or dead is also recorded. Suitable family planning advice is given and recorded. The illness for which the mother has primarily brought the child is treated.



14.1 The direction of weight curve is more important than the actual weight at any one point.

The mother retains the card and is advised to look after it. Experience has shown that the card is seldom lost, and with a little explanation, it is looked after quite well. The best way to keep it is in its plastic bag and between the hard covers of an old school exercise book.

The mother should be encouraged to bring the child once a month for weighing as well as follow up of immunization and family planning advice. By recording the weight serially, the progress of the child can be judged much better than by a single weight. It is the trend of the weight curve that is important rather than a single record. The serial weight record helps to identify mild deviation from normal i.e. mild malnutrition, which it would be difficult to do without a serial weight record. Any child whose weight shows flattening of the curve for 3 to 4 months is in danger of developing severe malnutrition and needs special attention and advice.

The under-5 card can be used for recording various things like haemoglobin estimation, stool examination, the day the vitamin A dose was given,

or deworming done, etc. The family should be taught to understand the record on the card and its significance. That, in itself, would be one method of health education. Simple instructions regarding diet are printed on the card and the family should be encouraged to read and follow the advice. The main value of the growth chart is that it is a practical and powerful tool for teaching mothers how to protect their child's healthy growth. With the chart, a mother can see progress or the lack of it, see the monthly weight gain or setbacks, see the downward fall after diarrhoea or any other infection and the upward jumps from extra feeding.

### **Identifying a high risk child**

In a large clinic or in the community, the number of children under 5 may be so large that it may not be possible to give sufficient time and attention to all of them. It is necessary therefore to identify the children who are particularly at risk. There may be some variation from one place to another but the basic criteria remain the same, and are as follows:-

1. Twins or low birth weight singletons
2. Where breast feeding has not been established or is insufficient
3. One parent
4. Working mother
5. Inadequate or no weight gain for 3 months
6. History of death of more than 2 siblings during the first two years of life
7. Repeated infections
8. Birth order 5 or more
9. Weight below 70 per cent of expected weight (2nd degree malnutrition)
10. Spacing of less than 2 years
11. Illness of parents, alcoholism, etc.

The cards of the high risk children should be specially stamped so that they can be identified easily. It is obvious that some of the risk factors will keep changing and a child who is not at risk one day, may become at risk after 2 or 3 months, or vice versa.

The children with weights below 60 per cent, or third degree malnutrition, are really in danger and should preferably be seen in a separate nutrition clinic.



It is important to remember that in any health care programme the earliest evidence of malnutrition should be identified and managed appropriately. One should not wait and watch till the child becomes marasmic. Here the serial weight of the child and his general well-being are of prime importance. If he is growing well and has abundant energy and liveliness, he is obviously a healthy child.

### **Advice regarding spacing**

It has been shown that short spacing is associated with poor nutritional status and higher morbidity and mortality. This is understandable because when a new baby is born the mother has to shift her attention to him and the older one is neglected to a certain extent. Also breast milk is now needed for the new baby. In many cultures, the mother stops breast feeding as soon as she becomes pregnant. The attention of the parents and the family shifts, to a certain extent, to the new arrival and away from the older child. It has been shown in several studies that the larger the number of children in a family, the greater is the extent of malnutrition, because more have to be fed and looked after. Mortality, morbidity and malnutrition is higher in birth order five and above, than in birth orders less than five. With each death in the sib-ship the motivation to family planning becomes less, because the mother becomes unsure about the survival of her children. So it is clear that child health should be an essential part of any family planning programme, as child survival seems to be the strongest motivating force. Spacing of 3 years or more, is associated with a lower level of malnutrition, morbidity and mortality, and helps in reducing the family size.

Advice regarding spacing can be given both if the baby is healthy and gaining weight, or is malnourished and ill. In the former case, the health worker can say something like: "Mother, your child is well and healthy and you would want him to remain that way. So you should be free to devote your time to him and look after him, but if you become pregnant soon, you won't be able to do that." If the baby is not progressing well, then the attitude should be: "Your baby needs all your attention as he is not well and not gaining in weight. So do not become pregnant yet, or you will not be able to look after him." A message that is conveyed repeatedly goes home. Since the mother comes again and again with her child to the clinic, the ideal place to advise family planning is the under-5 clinic, and competent advice and facilities should be available right there.

Every point of contact should be utilised for conveying the family planning message such as (i) after a miscarriage, (ii) birth of a small baby

or twins, and (iii) in the event of another pregnancy, and (iv) whenever mother visits the clinic with her child.

### **The personnel of the under-5 clinic**

Almost all the work can be done by the health auxiliaries and local helpers. Any intelligent village boy or girl can be taught to weigh the children and fill up the cards. Immunization, nutrition advice and treatment of minor morbidity, can all be done by the auxiliaries. Any serious or difficult problem should be referred to the doctor, whose role is mainly to organise, train and supervise the work of the auxiliaries.

In rural areas, the Balwadis and Balsevikas can be drawn into the under-5 clinic work and their help can be sought for nutrition and health education, contacting the community and helping with a supplementary feeding programme. Anganwadis under the Integrated Child Development Services programme can carry on these functions also.

Since the mothers have to wait for some time while getting their children registered, weighed or immunized, this time can be utilised for teaching them such things as causation of infections, reasons for a child not thriving, nutritional needs, hygiene, environmental sanitation etc. This education can be done in small groups with the help of audio-visual aids like charts, flip cards, flannelgraphs etc. The message should be simple, repeated often and should be followed by questions and answers sessions. It is important to demonstrate methods of cooking, the amount of food to be given and the methods of feeding. Common household articles of cooked food should be demonstrated and the quantity needed for the child explained and stressed.

It must be remembered that it is the personality and the quality of the worker that is more important for health education than all kinds of visual aids. If the worker has adequate knowledge and can develop a good rapport with the mother, and teaches her with confidence, skill and sympathy, the message is likely to be accepted. Hence personality, knowledge, dedication and tact are of fundamental importance. □



## HEALTH AND NUTRITION EDUCATION

In a developing country like India, there are many constraints to better living and adequate nutrition. Incomes are low, houses are inadequate, there is overcrowding and environmental sanitation is poor. Illiteracy is widespread. Most of these problems are beyond the scope of the health worker, and yet the community can be helped in several ways.

### **How to reach the community ?**

#### *The home*

Home is the ideal place, because only by seeing the problems at home can one find the remedies. The size of the house, ventilation, neighbourhood sanitation, etc., are all crucial to better health and nutrition. A home visit breeds confidence, and the family at once becomes more responsive and receptive. The mother's time should not—and need not—be wasted. If she is cooking, she can continue to do that and the health worker can sit near her and talk. This will provide a good opportunity to discuss nutrition and what the mother can do within her limitations. She can be taught about the quantity of food that she should give her children, with reference to the bowls and spoons which she has in the house. The worker can notice the cleanliness, or otherwise, of her house, refuse bin, flies, etc., and particularly, whether or not the food and water are protected; and help her to understand how she can improve hygiene. If the house is clean and utensils are shining, she can be complimented. It is best to visit the home at a time when the mother has some leisure and is not too busy.

One should be careful not to criticise or ridicule a prevalent practice or belief. Every community has these and many are, in fact, sound. These should be encouraged. Some others may be quite harmless. These should be got around. A few practices which are harmful such as delayed supplementary feeding, stopping food during illness etc., will need tact and patience to handle and change. An effort should be made to get round those that are not and influence the family in spite of them. For example, if the mother is insistent that she will not give cereals to the baby before a certain age, alternatives of pulses, banana, mashed vegetables, etc., can be suggest-



ed. Just as in a family one has to accept the older people's ideas and yet get one's own views accepted gently but firmly, the same has to be done in health education in the community. Often it is not the mother alone who has to be educated, but the grandmother, because she wields authority in the house or may be looking after the baby while the mother goes out to work. It is no use getting angry with the mother for what the grandmother does not allow her to do. The problem must be gently and tactfully discussed with the grandmother.

### **The community**

Community participation and involvement is the key to a successful health and nutrition programme. The community must be involved in planning, in identifying priorities and in various stages of implementation and monitoring. No programme, however good, can be imposed on the community. With gentle persuasion, the community can be got around to ac-



- 15.1 Health and nutrition education is not only meant for the mother, but for the father also who is usually the decision maker in the home.





15.2 Community education is essential for the success of any health programme.

cepting better health care practices. Periodic meetings with village elders, school teachers, women's groups etc., can be very rewarding.

There are several meeting places like the Health Centre, Primary School, Balwadi, Anganwadi, Mahila Mandal, Panchayat Ghar, etc., where the community collects. Opportunity should be taken to meet in small groups, sitting around comfortably and in a relaxed manner. There should be time enough for an informal chat and questions and answers. The mothers may seem apathetic and unresponsive, but given time they will relax and participate actively. The message of the talk should be brief and simple. If any visual aids are used, these should be simple with a clear message, rather than cluttering up the poster or the slides with too many things. The Central Health Education Bureau and the Voluntary Health Association of India, New Delhi, are producing some good teaching aids.

The quantity of raw and cooked food needed at different ages should be demonstrated, as well as better cooking methods. A few converted mothers can then be used as torch bearers, and to teach other mothers.



This is very effective because they belong to the community, and is also helpful because of the shortage of staff. Those who can read should be given some simple advice in a pamphlet, which should be suitably illustrated. Radio and television can also be used effectively; and actually, health workers should advise the authorities about the subjects and content of the programmes because they know the listeners and viewers much better. A good worker, however, manages to get across his message without any elaborate teaching aids.

### **What to emphasise?**

#### *Nutrition*

1. Importance of breast feeding.
2. Early introduction of semi-solids and solids. Only commonly used recipes should be stressed with simple ways of improving them. The workers should know the prevailing prices. Only locally available foods should be emphasised.
3. Quantity of food required and the number of times a mother must feed her child.
4. Importance of cleanliness in cooking and feeding.
5. Actual demonstration of cooking and quantities of food.
6. Importance of adequate food and water during illness.
7. Importance of clean water.
8. Better methods of cooking to prevent loss of nutrients.
9. Importance of vitamin A prophylaxis.

#### **Prevention of infections**

1. Importance of hand washing.
2. Environmental cleanliness.
3. Common causes of diarrhoea and parasitic infection and ways to prevent these.
4. Prevention against other infections.
5. Immunization.

#### **Treatment of common illnesses**

1. How to deal with diarrhoea?
2. What to do with cases of fever? How to feed in fever?
3. How to identify children with cough and fever who have developed restlessness and breathing difficulty?



**Growth**

1. Familiarity with the under-5 card and the growth pattern.

**Care of the mother**

1. Need for extra food (cereals, pulses, green leafy vegetables) during pregnancy and lactation.
2. Importance of prenatal care.
3. Treatment of anaemia.
4. Tetanus toxoid to prevent tetanus in the mother and the newborn baby.
5. Adequate spacing of children and the advantages of small families.

**Safe drinking water**

The water should be taken from either the municipal system or a deep well. It should be stored in covered pots and a long handled ladle should be used for taking out the water. Often the source of water is safe, but gets contaminated from the environment. Whenever possible, a hand pump should be installed.

If the source of water is unsafe, then the following methods can be used for purifying it:

1. Slow sand filtration.
2. Chlorination.

Bleaching powder contains about 33% of available chlorine and 20mg. is sufficient for 5 litres of water. That will give a concentration of about 1 mg. of available chlorine per litre. Bleaching powder is not suitable for turbid and highly polluted water.

3. Two drops of tincture iodine to a litre of water makes it safe, even though the taste is slightly altered.
4. Potassium permanganate-1 drachm to 200 gallons of water. It is a weak disinfectant.
5. Most practical advice is probably to strain through a clean cloth and boil for 5-10 minutes. Shortage of fuel is a great constraint.

Collection of rain water and its storage is now being done in many places.

### **Environmental Sanitation**

This is fundamental for reducing the incidence of disease. The emphasis should be on:

1. Proper drainage, ideally linked to a kitchen or community garden.
2. Proper collection and disposal of refuse, best utilised as compost.
3. Keeping the well surroundings clean.
4. Not allowing bathing or cattle near the source of drinking water.
5. Discouraging defecation in the open, which is a common practice both in the rural and semi-urban areas. This leads to contamination of the soil and water supply, which, in turn, results in intestinal infections and parasitic infestation. Bore latrines or trench latrines can help to solve the problem. This needs a team approach of engineers, sanitation staff and health workers.

### **Kitchen gardens**

Vegetables and fruits are expensive, but if every house-holder can grow a few greens, pumpkins, carrots, etc., these will form valuable additions to the diet. Drumstick trees grow fast and the leaves and the drumsticks have high nutritional value. Similarly papaya, guava and banana trees can be grown. Coconuts are grown in the coastal regions.

### **Poultry**

Eggs are a good source of high quality proteins and vitamin A. A few hens can supply eggs for the children.

### **Community participation**

The participation of the community is essential for the success of any health programme. It should be considered their programme rather than anything that a particular agency of the government is doing for them. They should become active partners in the programme and can participate in suggesting priorities, organising the work, providing space, equipment and volunteers for doing the work. The initial contact with the community is usually through their leaders, elders, village teachers, etc. Young



men and women of the community can help with the programme, such as ensuring cleanliness of the village or their neighbourhood, reporting any illness, helping with immunization and distribution of food supplement, etc. The older people can give the programme stability by adopting it as their own. The community can also try and raise some financial resources. The health workers should meet the community leaders once in two months or so, and the occasion can be used for a get-together, both for discussing the progress of work and deciding future plans, as well as provide a meeting place for cultural activities, etc. A willing and active community can take over a great deal of the burden of the health worker and can help to spread the message of health.



15.3 Demonstration is a good method of teaching good health practices. The health worker merely has to encourage her and compliment her for this.

## ANNEXURES



ANNEXURE 1

RECOMMENDED FOOD AT DIFFERENT AGES

Chart 1

Start this food from 4-6 months of age.

Dal



Banana



Khichri



Sag



Vegetables





















Wheat Flour  
Porridge



Chart 2

## FOR ONE YEAR OLD CHILD








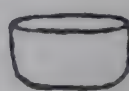



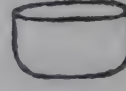






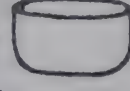
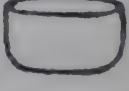
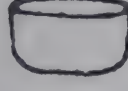


Morning	 125 g Milk	 1 Sugar	 or  1 Slice 1/2 Chapati		
10 O'Clock	 1 Banana	or	 1 Chapati	or	 1/2 Katori Atta Halwa
Noon	 1 1/2 Chapati	 1/2 Katori Dal		 Green Vegetables	
2 O'Clock	 1/2 Katori Atta Halwa		or	 1 Slice	
4 O'Clock	 125 g Milk	 1 Sugar	 or  1 Slice 1/2 Chapati		
Night	 1 Chapati		 1/2 Katori Dal		

Wheat-based diet



Chart 3

## FOR ONE YEAR OLD CHILD

Morning	 125g Milk	 1 Sugar	 or  or  1 Slice    1/2 Katori Rice    Suji Kheer		
10 O'Clock	 1 Banana	or	 1 Katori Khichri	or	 1/2 Katori Suji Halwa
Noon	 1 1/2 Katori Khichri	or	 +   1 Katori Rice    1/2 Katori Dal    Green Vegetables		
2 O'Clock	 1/2 Katori Suji Halwa	or	 1/2 Katori Khichri	or	 1 Slice
4 O'Clock	 125g Milk	 1 Sugar	 or  or  1 Slice    1/2 Katori Rice    1/2 Katori Suji Halwa		
Night	 1 Katori Khichri	or	 +  1/2 Katori Rice    1/2 Katori Dal		

Rice-based diet

Chart 4

## FOR TWO YEARS OLD CHILD










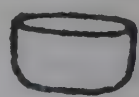
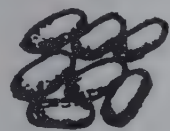
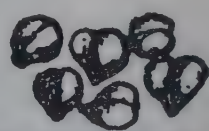


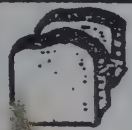


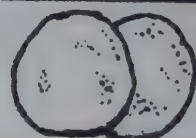









Morning	 125 g Milk	 1 Sugar	 1 Slice	or	 1/2 Chapati
10 O'Clock	 1 Banana	or	 1 Chapati	or	 1/2 Katori Khichri
Noon	 1 Katori Khichri	or	 1 Chapati	+	 1/2 Katori Dal
2 O'Clock	 Groundnuts	or	 Roasted Gram		
4 O'Clock	 125g Milk	 1 Sugar	 2 Slices	or	 1 Chapati
Night	 1 Katori Rice	or	 2 Chapatis	 1/2 Katori Dal	 Green Vegetable



Chart 5

RECOMMENDED FOOD INTAKE FOR ONE TO TWO YEARS OLD CHILD

Name of food	Dry wt (g)	Quantity Dry      Cooked	Calories	Proteins (g)	Nutrients supplied
RICE	60		206	4.1	Carbohydrates, Proteins
WHEAT	88		300	10.6	B <sub>1</sub> , B <sub>2</sub> , Niacin, B <sub>6</sub> , Carbohydrates, Proteins
PULSE	50		167	11.1	B <sub>1</sub> , Niacin, Carbohydrates, Proteins
MILK	250		168	8.0	A, D, B <sub>2</sub> , B <sub>6</sub> , Calcium
SUGAR OR JAGGERY	15		60	—	Carbohydrates
GREEN LEAFY VEGETABLES	50		—	—	Carotene, B <sub>2</sub> , B <sub>6</sub> , Iron, Calcium
OIL	11		99	—	Fat (essential fatty acids)
VEGETABLES & FRUITS	Recommended if economically feasible		—	—	—

Total value      1000      33.8

1 Katori Rice ≡ 2 Chapatis

1 Chapati ≡ 1/2 Katori Rice ≡ 1 Banana ≡ 2 Small slices of bread

1 Katori ≡ 200 ml

Requirements of one year old child :    Calories    1000 ; Proteins 17 g

## ANNEXURE 2

## ANTHROMETRIC STANDARDS OF REFERENCE

Table 1. Weight Chart of children upto five years

## A. BOYS' WEIGHT (Kg)

Age (months)	Percentile			Standard deviation			Age (months)			Percentile			Standard deviation		
	3rd	50th	97th	—3	—4	—5	1	2	3	3rd	50th	97th	—3	—4	—5
1	2	3	4	5	6										
0.0	2.5	3.3	4.2	2.0	1.6		31.0	11.0	13.7	17.0	9.4	8.0			
1.0	3.0	4.3	5.6	2.2	1.6		32.0	11.1	13.9	17.2	9.5	8.0			
2.0	3.6	5.2	6.7	2.6	1.8		33.0	11.3	14.1	17.4	9.6	8.1			
3.0	4.2	6.0	7.6	3.1	2.2		34.0	11.4	14.3	17.6	9.7	8.1			
4.0	4.8	6.7	8.4	3.7	2.7		35.0	11.5	14.4	17.8	9.7	8.2			
5.0	5.4	7.3	9.1	4.3	3.3		36.0	11.6	14.6	18.0	9.8	8.2			
6.0	6.0	7.8	9.7	4.9	3.9		37.0	11.7	14.8	18.2	9.9	8.3			
7.0	6.5	8.3	10.2	5.4	4.5		38.0	11.9	15.0	18.5	10.0	8.3			
8.0	7.0	8.8	10.7	5.9	4.9		39.0	12.0	15.2	18.7	10.1	8.4			
9.0	7.4	9.2	11.1	6.3	5.3		40.0	12.1	15.3	18.9	10.2	8.5			
10.0	7.7	9.5	11.5	6.6	5.6		41.0	12.2	15.5	19.1	10.3	8.5			
11.0	8.0	9.9	11.9	6.9	5.9		42.0	12.4	15.7	19.3	10.4	8.6			
12.0	8.2	10.2	12.2	7.1	6.1		43.0	12.5	15.8	19.5	10.5	8.7			



Table—1 Contd.

1	2	3	4	5	6	1	2	3	4	5	6
13.0	8.5	10.4	12.5	7.3	6.3	44.0	12.6	16.0	19.7	10.6	8.8
14.0	8.7	10.7	12.8	7.5	6.4	45.0	12.7	16.2	19.9	10.7	8.8
15.0	8.8	10.9	13.1	7.6	6.5	46.0	12.9	16.4	20.1	10.8	8.9
16.0	9.0	11.1	13.3	7.7	6.6	47.0	13.0	16.5	20.3	10.9	9.0
17.0	9.1	11.3	13.6	7.8	6.7	48.0	13.1	16.7	20.5	11.0	9.1
18.0	9.3	11.5	13.8	7.9	6.8	49.0	13.3	16.9	20.8	11.1	9.2
19.0	9.4	11.7	14.0	8.0	6.8	50.0	13.4	17.0	21.0	11.2	9.3
20.0	9.5	11.8	14.2	8.1	6.9	51.0	13.5	17.2	21.2	11.3	9.4
21.0	9.7	12.0	14.4	8.3	7.0	52.0	13.6	17.4	21.4	11.4	9.4
22.0	9.8	12.2	14.6	8.4	7.1	53.0	13.8	17.5	21.6	11.5	9.5
23.0	9.9	12.4	14.8	8.5	7.2	54.0	13.9	17.7	21.8	11.6	9.6
24.0	10.1	12.6	15.0	8.6	7.3	55.0	14.0	17.9	22.1	11.8	9.7
						56.0	14.2	18.0	22.3	11.9	9.8
25.0	10.3	12.5	15.7	9.0	7.8	57.0	14.3	18.2	22.5	12.0	9.9
26.0	10.4	12.7	15.9	9.1	7.9	58.0	14.4	18.3	22.7	12.1	10.0
27.0	10.6	12.9	16.1	9.1	7.9	59.0	14.6	18.5	23.0	12.2	10.1
28.0	10.7	13.1	16.4	9.2	7.9	60.0	14.7	18.7	23.2	12.3	10.2
29.0	10.8	13.3	16.6	9.3	7.9						
30.0	10.9	13.5	16.8	9.4	8.0						

Table 1. Weight Chart of children upto five years  
B. GIRLS' WEIGHT (Kg)

Age (months)	Percentile			Standard deviation			Age (months)			Percentile			Standard deviation		
	3rd	50th	97th	—3	—4	—5	1	2	3	3rd	50th	97th	—3	—4	—5
	2	3	4		6					2	3	4	5		6
0.0	2.3	3.2	3.9	1.7	1.2		31.0	10.7	13.2	16.5	9.1	7.8			
1.0	2.9	4.0	5.0	2.2	1.6		32.0	10.8	13.4	16.8	9.2	7.9			
2.0	3.4	4.7	6.0	2.7	2.0		33.0	10.9	13.6	17.0	9.4	7.9			
3.0	4.0	5.4	6.9	3.2	2.4		34.0	11.1	13.8	17.3	9.5	8.0			
4.0	4.6	6.0	7.6	3.7	2.9		35.0	11.2	13.9	17.5	9.6	8.1			
5.0	5.1	6.7	8.3	4.1	3.3		36.0	11.3	14.1	17.8	9.7	8.2			
6.0	5.6	7.2	8.9	4.6	3.7		37.0	11.5	14.3	18.0	9.8	8.3			
7.0	6.0	7.7	9.5	5.0	4.1		38.0	11.6	14.4	18.2	9.9	8.4			
8.0	6.4	8.2	10.0	5.3	4.4		39.0	11.7	14.6	18.5	10.0	8.5			
9.0	6.7	8.6	10.4	5.7	4.7		40.0	11.8	14.8	18.7	10.1	8.5			
10.0	7.0	8.9	10.8	5.9	4.9		41.0	12.0	14.9	18.9	10.2	8.6			
11.0	7.3	9.2	11.2	6.2	5.1		42.0	12.1	15.1	19.1	10.3	8.7			
12.0	7.6	9.5	11.5	6.4	5.3		43.0	12.2	15.2	19.4	10.4	8.8			
13.0	7.8	9.8	11.8	6.6	5.5		44.0	12.3	15.4	19.5	10.6	8.9			
14.0	8.0	10.0	12.0	6.7	5.6		45.0	12.4	15.5	19.8	10.6	8.9			



Table 1 *Contd.*

1	2	3	4	5	6	1	2	3	4	5	6
15.0	8.1	10.2	12.3	6.9	5.8	46.0	12.5	15.0	20.0	10.7	9.0
16.0	8.3	10.4	12.5	7.0	5.9	47.0	12.7	15.8	20.2	10.8	9.1
17.0	8.5	10.6	12.7	7.2	6.0	48.0	12.8	16.0	20.4	10.9	9.2
18.0	8.6	10.8	13.0	7.3	6.1	49.0	12.9	16.1	20.6	10.9	9.2
19.0	8.8	11.0	13.2	7.5	6.3	50.0	13.0	16.2	20.8	11.0	9.3
20.0	8.9	11.2	13.4	7.6	6.4	51.0	13.1	16.4	21.0	11.1	9.4
21.0	9.1	11.4	13.6	7.8	6.5	52.0	13.2	16.5	21.2	11.2	9.4
22.0	9.3	11.5	13.9	7.9	6.7	53.0	13.3	16.7	21.4	11.3	9.5
23.0	9.4	11.7	14.1	8.1	6.8	54.0	13.4	16.8	21.6	11.4	9.6
24.0	9.6	11.9	14.3	8.2	7.0	55.0	13.5	17.0	21.8	11.5	9.6
						56.0	13.6	17.1	22.0	11.5	9.7
25.0	9.8	12.0	14.8	8.4	7.2	57.0	13.7	17.2	22.3	11.6	9.8
26.0	9.9	12.2	15.1	8.5	7.3	58.0	13.8	17.4	22.5	11.7	9.8
27.0	10.1	12.4	15.4	8.7	7.4	59.0	13.9	17.5	22.7	11.8	9.9
28.0	10.2	12.6	15.7	8.8	7.5	60.0	14.0	17.7	22.9	11.9	9.9
29.0	10.4	12.8	15.9	8.9	7.6						
30.0	10.5	13.0	16.2	9.0	7.7						

\*Source : United States Department of Health, Education, and Welfare, National Centre for Health Statistics. NCH's growth charts 1976. *Monthly and vital statistics report*, 25: No. 3 (Supplement) (1976).

Table 2. Height Chart of children upto five years  
A. BOYS' HEIGHT cm

Age (months)	Percentile				Standard deviation			Percentile				Standard deviation		
	3rd	50th	97th	Age (months)	—3	—4	6	3rd	50th	97th	Age (months)	—3	—4	6
1	2	3	4	1	5			2	3	4	1	5		
0.0	46.2	50.5	54.8	31.0	43.4	41.1		84.5	91.2	97.9	31.0	80.5		77.0
1.0	49.9	54.6	59.2	32.0	47.1	44.6		85.2	92.0	98.8	32.0	81.5		77.9
2.0	53.2	58.1	62.9	33.0	50.4	47.8		85.8	92.7	99.6	33.0	81.7		78.1
3.0	56.1	61.1	66.1	34.0	53.3	50.6		86.5	93.5	100.4	34.0	82.3		78.6
4.0	58.7	63.7	68.7	35.0	55.8	53.2		87.1	94.2	101.3	35.0	82.9		79.2
5.0	60.8	65.9	71.0	36.0	58.0	55.4		87.8	94.9	102.1	36.0	83.5		79.7
6.0	62.8	67.8	72.9	37.0	60.0	57.3		88.4	95.6	102.9	37.0	84.7		81.1
7.0	64.5	69.5	74.5	38.0	61.7	59.1		89.0	96.3	103.7	38.0	85.2		81.5
8.0	66.0	71.0	76.0	39.0	63.2	60.7		89.6	97.0	104.4	39.0	85.6		81.8
9.0	67.4	72.3	77.3	40.0	64.7	62.1		90.3	97.7	105.2	40.0	86.1		82.2
10.0	68.7	73.6	78.6	41.0	66.0	63.4		90.9	98.4	106.0	41.0	86.6		82.6
11.0	69.9	74.9	79.9	42.0	67.2	64.6		91.5	99.1	106.7	42.0	87.0		83.0
12.0	71.0	76.1	81.2	43.0	68.3	65.7		92.1	99.7	107.4	43.0	87.5		83.4



Table 2 Contd.

1	2	3	4	5	6	1	2	3	4	5	6
13.0	72.1	77.2	82.4	69.3	66.7	44.0	92.6	100.4	108.2	88.0	83.8
14.0	73.1	78.3	83.6	70.3	67.6	45.0	93.2	101.0	108.9	88.4	84.2
15.0	74.1	79.4	84.8	71.2	68.5	46.0	93.8	101.7	109.6	88.9	84.6
16.0	75.0	80.4	85.9	72.1	69.3	47.0	94.4	102.3	110.3	89.3	85.0
17.0	75.9	81.4	87.0	72.9	70.1	48.0	94.9	102.9	111.0	89.8	85.4
18.0	76.7	82.4	88.1	73.7	70.8	49.0	95.5	103.6	111.6	90.3	85.8
19.0	77.5	83.3	89.2	74.5	71.5	50.0	96.0	104.2	112.3	90.7	86.2
20.0	78.3	84.2	90.2	75.2	72.2	51.0	96.6	104.8	113.0	91.2	86.6
21.0	79.1	85.1	91.2	75.9	72.8	52.0	97.1	105.4	113.6	91.6	87.0
22.0	79.8	86.0	92.2	76.6	73.5	53.0	97.7	106.0	114.5	92.1	87.5
23.0	80.6	86.8	93.1	77.4	74.2	54.0	98.2	106.6	114.9	92.5	87.9
24.0	81.3	87.6	94.0	78.1	74.9	55.0	98.7	107.1	115.5	93.0	88.3
						56.0	99.2	107.7	116.2	93.4	88.7
25.0	80.3	86.4	92.5	76.7	73.5	57.0	99.8	108.3	116.8	93.9	89.1
26.0	81.0	87.2	93.5	77.3	74.1	58.0	100.3	108.8	117.4	94.4	89.5
27.0	81.7	88.1	94.4	78.0	74.7	59.0	100.8	109.4	118.0	94.8	89.9
28.0	82.4	88.9	95.3	78.6	75.0	60.0	101.3	109.9	118.6	95.3	90.4
29.0	83.1	89.6	96.2	79.2	75.7						
30.0	83.8	90.4	97.0	79.9	76.3						

Table 2. Height Chart of children upto five years  
B. GIRLS' HEIGHT (cm)

Age (months)	Percentile			Standard deviation			Age (months)			Percentile			Standard deviation		
	3rd	50th	97th	—3	5	—4	1	2	3	3rd	50th	97th	—3	5	—4
1	2	3	4			6				2	3	4			6
0.0	45.8	49.9	53.9	42.1		39.5	31.0	83.6	90.2	96.8	79.7	76.2			
1.0	49.2	53.5	57.9	45.9		43.3	32.0	84.3	91.0	97.7	80.3	76.8			
2.0	52.2	56.8	61.3	49.1		46.6	33.0	85.1	91.8	98.5	81.0	77.4			
3.0	54.9	59.5	64.2	51.9		49.4	34.0	85.7	92.5	99.3	81.6	78.0			
4.0	57.2	62.0	66.8	54.3		51.8	35.0	86.3	93.3	100.3	82.1	78.4			
5.0	59.2	64.1	69.0	56.4		53.9	36.0	86.9	94.1	101.2	82.8	79.1			
6.0	61.0	65.9	70.9	58.2		55.6	37.0	87.6	94.7	101.9	83.4	79.7			
7.0	62.5	67.6	72.0	59.8		57.2	38.0	88.2	95.4	102.6	84.0	80.3			
8.0	64.0	69.1	74.1	61.2		58.6	39.0	88.8	96.0	103.2	84.6	80.8			
9.0	65.3	70.4	75.6	62.5		59.8	40.0	89.4	96.7	103.9	85.2	81.4			
10.0	66.6	71.8	77.0	63.7		61.0	41.0	90.0	97.3	104.6	85.8	81.9			
11.0	67.8	73.1	78.3	64.9		62.2	42.0	90.6	97.9	105.2	86.3	82.5			
12.0	69.0	74.3	79.6	66.0		63.3	43.0	91.2	98.5	105.9	86.9	83.0			
13.0	70.1	75.5	80.9	67.1		64.3	44.0	91.8	99.2	106.5	87.4	83.5			
14.0	71.2	76.7	82.1	68.1		65.3	45.0	92.4	99.8	107.2	88.0	84.0			



Table 2 Contd.

1	2	3	4	5	6	1	2	3	4	5	6
15.0	72.2	77.8	83.3	69.1	66.2	46.0	92.9	100.4	107.8	88.5	84.5
16.0	73.2	78.9	84.5	70.1	67.2	47.0	93.5	101.0	108.5	89.0	85.0
17.0	74.2	79.9	85.6	71.0	68.0	48.0	94.0	101.6	109.1	89.5	85.5
18.0	75.2	80.9	86.7	71.9	68.9	49.0	94.6	102.2	109.8	90.0	86.0
19.0	76.1	81.9	87.7	72.8	69.7	50.0	95.1	102.7	110.4	90.5	86.4
20.0	77.0	82.9	88.8	73.6	70.5	51.0	95.6	103.3	111.0	91.0	86.9
21.0	77.8	83.8	89.8	74.4	71.3	52.0	96.1	103.9	111.7	91.5	87.3
22.0	78.7	84.7	90.8	75.2	72.1	53.0	96.6	104.5	112.3	92.0	87.8
23.0	79.5	85.6	91.7	76.0	72.8	54.0	97.2	105.0	112.9	92.4	88.2
24.0	80.3	86.5	92.6	76.8	73.6	55.0	97.7	105.6	113.6	92.9	88.6
						56.0	98.1	106.2	114.2	93.3	89.1
25.0	79.1	85.3	91.5	75.4	72.1	57.0	98.6	106.7	114.8	93.8	89.5
26.0	79.9	86.2	92.5	76.2	72.8	58.0	99.1	107.3	115.4	94.2	89.9
27.0	80.7	87.0	93.3	76.9	73.5	59.0	99.6	107.8	116.0	94.7	90.3
28.0	81.4	87.8	94.2	77.6	74.2	60.0	100.1	108.4	116.7	95.1	90.7
29.0	82.2	88.6	95.0	78.4	75.0						
30.0	82.9	89.4	95.9	79.0	75.6						

Table 3. Weight in relation to height: both sexes, 52-108 cm height\*

Height (cm)	Weight (kg)				
	Standard 1	90% standard 2	80% standard 3	70% standard 4	60% standard 5
52	3.8	3.4	3.0	2.7	2.3
53	4.0	3.6	3.2	2.8	2.4
54	4.3	3.9	3.4	3.0	2.6
55	4.6	4.1	3.6	3.2	2.7
56	4.8	4.3	3.8	3.4	2.9
57	5.0	4.5	3.9	3.5	3.0
58	5.2	4.7	4.2	3.6	3.1
59	4.5	4.9	4.4	3.8	3.3
60	5.7	5.1	4.6	4.0	3.4
61	6.0	5.4	4.8	4.2	3.6
62	6.3	5.7	5.0	4.4	3.8
63	6.6	5.9	5.3	4.6	3.9
64	6.9	6.2	5.5	4.8	4.1
65	7.2	6.5	5.8	5.0	4.3
66	7.5	6.8	6.0	5.3	4.5
67	7.8	7.0	6.2	5.5	4.7
68	8.1	7.3	6.5	5.7	4.9
69	8.4	7.6	6.7	5.9	5.0
70	8.7	7.8	7.0	6.1	5.2
71	9.0	8.1	7.2	6.2	5.3
72	9.2	8.3	7.4	6.4	5.5
73	9.5	8.5	7.6	6.6	5.6
74	9.7	8.7	7.8	6.8	5.8
75	9.9	9.0	8.0	6.9	5.9
76	10.2	9.2	8.3	7.1	6.1
77	10.4	9.4	8.3	7.2	6.2
78	10.6	9.5	8.5	7.4	6.4
79	10.8	9.7	8.6	7.5	6.5
80	11.0	9.9	8.8	7.7	6.6

contd.



Table 3. *contd.*

	1	2	3	4	5
81	11.2	11.0	9.0	7.8	6.7
82	11.4	10.3	9.1	8.0	6.8
83	11.6	10.4	9.2	8.1	6.9
84	11.8	10.6	9.4	8.3	7.1
85	12.0	10.7	9.6	8.4	7.2
86	12.2	11.0	9.8	8.5	7.3
87	12.4	11.1	9.9	8.6	7.4
88	12.6	11.3	10.1	8.8	7.6
89	12.8	11.5	10.2	9.0	7.7
90	13.1	11.8	10.5	9.2	7.9
91	13.4	11.9	10.7	9.3	8.0
92	13.6	12.2	10.9	9.5	8.2
93	13.8	12.4	11.0	9.6	8.3
94	14.0	12.6	11.2	9.8	8.4
95	14.3	12.8	11.4	10.0	8.5
96	14.5	13.1	11.6	10.2	8.7
97	14.7	13.3	11.8	10.3	8.8
98	15.0	13.5	12.0	10.5	9.0
99	15.3	13.7	12.3	10.7	9.2
100	15.6	14.0	12.5	10.9	9.4
101	15.8	14.2	12.6	11.1	9.5
102	16.1	14.5	12.9	11.3	9.7
103	16.4	14.7	13.2	11.5	9.8
104	16.7	15.0	13.4	11.7	10.0
105	17.0	15.3	13.6	11.9	10.1
106	17.3	15.6	13.8	12.1	10.4
107	17.6	15.9	14.0	12.3	10.5
108	18.0	16.2	14.4	12.6	10.8

\*Adapted from Jelliffe, D.B., *WHO Monograph Series*, No. 53 (1966).

Table 4. Weight chart of well nourished Indian children upto 6 years (in months)  
BOYS

Age (months)	Mean weight (kg)	Percentage of the standard of reference-weight (kg)				
		90	80	70	60	50
At birth	3.1	2.8	2.4	2.1	1.8	1.5
3	5.7	5.1	4.6	4.0	3.4	2.9
6	7.5	6.8	6.0	5.3	4.5	3.8
9	8.7	7.9	7.0	6.1	5.2	4.4
12	9.5	8.6	7.6	6.7	5.7	4.8
18	10.7	9.6	8.6	7.5	6.4	5.4
24	11.7	10.5	9.3	8.2	7.0	5.8
30	12.9	11.6	10.4	9.1	7.8	6.5
36	13.6	12.3	10.9	9.5	8.2	6.8
42	14.5	13.1	11.6	10.2	8.7	7.3
48	14.9	13.4	11.9	10.4	9.0	7.5
54	16.0	14.4	12.8	11.2	9.6	8.0
60	17.0	15.3	13.6	11.9	10.2	8.5
66	18.0	16.2	14.4	12.6	10.8	9.0
72	19.5	17.5	15.6	13.6	11.7	9.7

## GIRLS

Age (months)	Mean Weight (kg.)	Percentage of the standard of reference-weight (kg)				
		90	80	70	60	50
At birth	2.9	2.6	2.4	2.1	1.8	1.5
3	5.5	5.0	4.4	3.9	3.3	2.8
6	6.9	6.2	5.5	4.8	4.2	3.5
9	7.9	7.1	6.3	5.6	4.8	4.0
12	8.7	7.8	7.0	6.1	5.2	4.4
18	9.6	8.7	7.7	6.7	5.8	4.8
24	10.6	9.5	8.5	7.4	6.4	5.3
30	11.8	10.6	9.4	8.2	7.1	5.9
36	12.6	11.3	10.1	8.8	7.5	6.3
42	13.7	12.4	11.0	9.6	8.2	6.9
48	14.3	12.8	11.4	10.0	8.6	7.1
54	15.1	13.6	12.1	10.6	9.1	7.6
60	16.0	14.4	12.8	11.2	9.6	8.0
66	16.6	14.9	13.3	11.6	10.0	8.3
72	17.2	15.5	13.8	12.0	10.3	8.6



Table 5. Height chart of well nourished Indian children upto 6 years (in months)  
BOYS

Age (months)	Mean Height (cm)	Percentage of the standard of reference-height (cm)				
		90	80	70	60	50
At birth	49.2	44.2	39.3	34.4	29.5	24.6
3	60.1	54.1	48.1	42.1	36.0	30.0
6	66.3	59.7	53.1	46.4	39.8	33.2
9	70.5	63.4	56.4	49.3	42.3	23.5
12	73.4	66.1	58.8	51.4	44.1	36.2
18	79.3	71.3	63.4	55.5	47.7	39.6
24	84.5	76.1	67.6	59.2	50.7	42.3
30	88.9	80.1	71.2	62.3	53.4	44.5
36	92.7	83.4	74.1	64.9	55.6	46.3
42	95.8	86.3	76.7	67.1	57.5	47.9
48	98.1	88.3	78.5	68.6	58.8	49.0
54	103.0	92.8	82.4	72.1	61.8	51.5
60	106.7	96.0	85.4	74.7	64.0	53.4
66	110.4	99.3	88.3	77.2	66.2	55.2
72	114.6	103.1	91.7	80.2	68.8	57.3

GIRLS

Age (months)	Mean Height (cm)	Percentage of the standard of reference-height (cm)				
		90	80	70	60	50
At birth	48.8	43.9	39.0	34.2	29.3	24.4
3	59.2	53.3	47.4	41.5	35.5	29.6
6	64.5	58.1	51.6	45.2	38.7	32.2
9	68.5	61.6	54.8	47.9	41.1	34.2
12	72.1	67.6	57.7	50.5	43.2	36.1
18	77.7	69.9	62.2	54.4	46.6	38.8
24	82.1	73.9	65.7	57.5	49.3	41.1
30	86.5	77.8	69.2	60.5	51.9	43.2
36	90.0	81.0	72.0	63.0	54.0	45.0
42	94.6	85.2	75.7	66.2	56.8	47.3
48	98.0	88.2	78.4	68.6	58.8	49.0
54	101.0	90.9	80.8	70.7	60.6	50.5
60	104.4	93.9	83.5	73.1	62.6	52.2
66	107.2	96.5	85.8	75.0	64.3	53.6
72	109.4	98.5	87.5	76.6	65.7	54.7

Table 6. Mid-arm Circumference (cm) of well nourished Indian children

	M	F
1 year	14.9	14.4
2 years	15.1	14.5
3 years	15.3	14.8
4 years	15.5	15.0
5 years	15.7	15.4
6 years	16.2	15.7

Reference for Tables 4, 5 and 6 : Ghosh S., Project No. 01-658-2, A longitudinal study of the outcome of a birth cohort. 1976.

### ANNEXURE 3 NUTRIENTS IN FOODSTUFFS

Table 1. Vitamin A rich foods (values per 100 g. of edible portion)

Foods	Carotene (ug)	Vitamin A (IU)
<i>Leafy vegetables</i>		
Colocasia leaves (black variety)	12000	
Colocasia leaves (green variety)	10278	
Turnip greens	9396	
Curry leaves	7560	
Coriander leaves	6918	
Agathi	5400	
Drumstick leaves	6780	
Rajagira leaves	14190	
Knol-Khol greens	4146	
Onion staks	595	
Spinach	5580	
Amaranth tender	5520	
Radish leaves	5295	
Mint	1620	
Bathwa leaves	1740	
Mustard leaves	2622	
Carrots	1890	



Table 1. Contd.

	carotene (ug)	vitamin A (IU)
<i>Fruits</i>		
Mango ripe	2743	
Apricots fresh	2160	
Orange	1104	
Papaya ripe	666	
<i>Milk &amp; milk Products</i>		
Milk		160
Cottage cheese		366
Khoya		497
<i>Fats and Oils</i>		
Butter		3200
Ghee (cow)		2000
Ghee (buffalo)		900
Vanaspati (fortified)		2500

Table 2. Riboflavin rich foods (values per 100 g. of edible portion)

<i>Foods</i>	
<i>Leafy vegetables</i>	
Turnip greens	Riboflavin (mg) 0.57
Beet greens	0.56
Radish leaves	0.47
Colocasia leaves (Black variety)	0.45
Fenugreek leaves	0.30
Colocasia leaves (green variety)	0.26
Spinach	0.29
Mint	0.26
Curry leaves	0.21
<i>Animal sources</i>	
Milk (cow)	0.19
Milk (buffalo)	0.10
Egg (hen)	0.40
Liver (sheep)	1.70

Table 3. Calcium rich foods (values per 100 g. of edible portion)  
Calcium (mg)

Foods	
<i>Green leafy vegetables</i>	
Curry leaves	830
Amaranth spined	800
Amaranth tender	397
Turnip leaves	710
Colocasia leaves (black variety)	460
Methi leaves	395
Radish leaves	265
Mint	200
Agathi	1130
Cauliflower greens	626
Knol-Khol greens	740
Drumstick leaves	440
<i>Cereals and pulses</i>	
Ragi	344
Rajmah	260
Soyabean	240
Bengal gram (whole)	202
<i>Animal sources</i>	
Small fish	790
Milk (buffalo)	210
Milk (cow)	120
Curds	149
Rohu fish	650
<i>Other foods</i>	
Jaggery coconut palm	1638
Jaggery date palm	363



Table 4. Iron rich foods (values per 100 g. of edible portion)

Iron (mg)

**Foods***Leafy vegetables*

Cauliflower greens	40.0
Colocasia leaves (black variety)	38.7
Turnip leaves	28.4
Amaranth tender	25.5
Bengal gram leaves	23.8
Fenugreek (methi) leaves	16.5
Spinach	10.9
Rajagira leaves	18.4
Mustard leaves	16.3
Knol-Khol greens	13.3

*Cereals and pulses*

Whole wheat flour	11.5
Soyabean	11.5
Bengal gram whole	10.2
Ragi	6.4
Bajra	5.0
Rice parboiled	4.0

*Animal foods*

Liver (sheep)	6.3
Mutton (muscle)	2.5
Egg (hen)	2.1
Fish dried	20—50

*Other foods*

Jaggery cane	11.4
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Table 5. Nutrients in foodstuffs

Names of foodstuffs	per 100 g of edible portion											
	Protein (g)	Fat (g)	Carbo- hydrates (g)	Energy (cal)	Calcium (mg)	Iron (mg)	Carotene ( $\mu$ g)	Thia- mine (mg)	Ribo- flavin (mg)	Niacin (mg)	Vit C (mg)	
1	2	3	4	5	6	7	8	9	10	11	12	
<i>Cereal grains and products</i>												
Bajra	11.6	5.0	67.5	361	42	5.0	132	0.33	0.25	2.3	0.0	
Jowar	10.4	1.9	72.6	349	25	5.8	47	0.37	0.13	3.1	0.0	
Maize, dry	11.1	3.6	66.2	342	10	2.0	90	0.42	0.10	1.8	0.0	
Ragi	7.3	1.3	72.0	328	344	6.4	42	0.42	0.19	1.1	0.0	
Rice, parboiled, handpounded	8.5	0.6	77.4	349	10	2.8	9	0.27	0.12	4.0	0.0	
Rice, parboiled, milled	6.4	0.4	79.0	346	9	4.0	—	0.21	0.05	3.8	0.0	
Rice, raw, handpounded	7.5	1.0	76.7	346	10	3.2	2	0.21	0.16	3.9	0.0	
Rice, raw, milled	6.8	0.5	78.2	345	10	3.1	—	0.06	0.06	1.9	0.0	
Rice, puffed	7.5	0.1	73.6	325	23	6.6	—	0.21	0.01	4.1	0.0	
Semolina (suji)	10.4	0.8	74.8	348	16	1.6	—	0.12	0.03	1.6	0.0	
Wheat (bulgar)	8.2	1.6	77.2	356	37	4.9	—	0.74	0.11	4.8	0.0	
Wheat (whole)	11.8	1.5	71.2	346	41	4.9	64	0.45	0.17	5.5	0.0	
Wheat flour (whole)	12.1	1.7	69.4	341	48	11.5	29	0.49	0.29	4.3	0.0	
<i>Pulses and legumes</i>												
Bengal gram (whole channa)	17.1	5.3	60.9	360	202	10.2	189	0.30	0.15	2.9	3.0	
Bengal gram dal	20.8	5.6	59.8	372	56	9.1	129	0.48	0.18	2.4	1.0	



1	2	3	4	5	6	7	8	9	10	11	12
Black gram dal (urd)	24.0	1.4	59.6	347	154	9.1	38	0.42	0.20	2.0	0.0
Green gram, whole (moong)	24.0	1.3	56.7	334	124	7.3	94	0.47	0.27	2.1	0.0
Green gram dal	24.5	1.2	59.9	348	75	8.5	49	0.72	0.21	2.4	0.0
Khesari dal	28.2	0.6	56.6	345	90	6.3	120	0.39	0.17	2.9	0.0
Lentil (masur)	25.1	0.7	59.0	343	69	4.8	270	0.45	0.20	2.6	0.0
Rajmah	22.9	1.3	60.6	346	260	5.8	—	—	—	—	0.0
Red gram dal (arhar)	22.3	1.7	57.6	335	73	5.8	132	0.45	0.19	2.9	0.0
Soyabean	43.2	19.5	20.9	432	240	11.5	426	0.73	0.39	3.2	—
<i>Leafy vegetables</i>											
Amaranth, spined (kantewali cholai)	3.0	0.3	7.0	43	800	22.9	3564	0.00	—	—	33.0
Amaranth, tender (chulai sag)	4.0	0.5	6.1	45	397	25.5	5520	0.03	0.30	1.2	99.0
Bathua leaves	3.7	0.4	2.9	30	150	4.2	1740	0.01	0.14	0.6	35.0
Bengal gram leaves (chane ka sag)	7.0	1.4	14.1	97	340	23.8	978	0.09	0.10	0.6	61.0
Coriander leaves (dhania leaves)	3.3	0.6	6.3	44	184	18.5	6918	0.05	0.06	0.8	135.0
Drumstick leaves (saijna)	6.7	1.7	12.5	92	440	7.0	6780	0.06	0.05	0.8	220.0
Fenugreek leaves (methi)	4.4	0.9	6.0	49	395	16.5	2340	0.04	0.31	0.8	52.0
Mint (podina)	4.8	0.6	5.8	48	200	15.6	1620	0.05	0.26	1.0	27.0
Mustard leaves (sarson ka sag)	4.0	0.6	3.2	34	155	16.3	2622	0.03	—	—	33.0
Radish leaves (mooli)	3.8	0.4	2.4	28	265	3.6	5295	0.18	0.47	0.8	81.0
Spinach (palak)	2.0	0.7	2.9	26	73	10.9	5580	0.03	0.26	0.5	28.0
Tamarind leaves, tender	5.8	2.1	18.2	115	101	5.2	250	0.24	0.17	4.1	3.0

I	2	3	4	5	6	7	8	9	10	11	12
<i>Roots and tubers</i>											
Carrot (gajar)	0.9	0.2	10.6	48	80	2.2	1890	0.04	0.02	0.6	3.0
Calcoasia (arvi)	3.0	0.1	21.1	97	40	1.7	24	0.09	0.03	0.4	0.0
Onion	1.2	0.4	11.1	50	47	0.7	0	0.08	0.01	0.4	11.0
Potato	1.6	0.1	22.6	97	10	0.7	24	0.10	0.01	1.2	17.0
Radish, white (mooli)	0.7	0.1	3.4	17	35	0.4	3	0.06	0.02	0.5	15.0
Sweet potato	1.2	0.3	28.2	120	46	0.8	6	0.08	0.04	0.7	24.0
Tapioca	0.7	0.2	38.1	157	50	0.9	—	0.05	0.10	0.3	25.0
Turnip (shalgam)	0.5	0.2	6.2	29	30	0.4	0	0.04	0.04	0.5	43.0
Yam (zimikand)	1.4	0.1	26.0	111	35	1.3	78	0.07	—	0.7	—
<i>Other vegetables</i>											
Beans	7.4	1.0	29.8	158	50	2.6	34	0.34	0.19	0.0	27.0
Bottle Gourd (lauki)	0.2	0.1	2.5	12	20	0.7	0	0.03	0.01	0.2	0.0
Brinjal	1.4	0.3	4.0	24	18	0.9	74	0.04	0.11	0.9	12.0
Cauliflower	2.6	0.4	4.0	30	33	1.5	30	0.04	0.10	1.0	56.0
Cucumber (kheera)	0.4	0.1	2.5	13	10	1.5	0	0.03	0.00	0.2	7.0
Ladies fingers (bhindi)	1.9	0.2	6.4	35	66	1.5	52	0.07	0.10	0.6	13.0
Mango, green	0.7	0.1	10.1	44	10	5.4	90	0.04	0.01	0.2	3.0
Peas	7.2	0.1	15.9	93	20	1.5	83	0.25	0.01	0.8	9.0
Pumpkin	1.4	0.1	4.6	25	10	0.7	50	0.06	0.04	0.5	2.0
Tinda	1.4	0.2	3.4	21	25	0.9	13	0.04	0.08	0.3	18.0
Tomato, green	1.9	0.1	3.6	23	20	1.8	192	0.07	0.01	0.4	31.0



1	2	3	4	5	6	7	8	9	10	11	12
<i>Nuts and oilseeds</i>											
Coconut, dry	6.8	62.3	18.4	662	40	2.7	0.00	0.08	0.01	3.0	7.0
Coconut, fresh	4.5	41.6	13.0	444	10	1.7	0.00	0.05	0.10	0.8	1.0
Gingelly seeds	18.3	43.3	25.0	563	1450	10.5	60.00	1.01	0.34	4.4	0.0
Groundnut	25.3	40.1	26.1	567	90	2.8	37.00	0.90	0.13	19.9	0.0
Groundnut, roasted	26.2	39.8	26.7	570	77	3.1	0.00	0.39	0.13	22.1	0.0
Mustard seeds	20.0	39.7	23.8	541	490	17.9	162.0	0.65	0.26	4.0	0.0
Sunflower seeds	19.8	52.1	17.9	620	280	5.0	0.00	0.86	0.20	4.5	1.0
Walnut	15.6	64.5	11.0	687	100	4.8	6.00	0.45	0.40	1.0	0.0
<i>Condiments and spices</i>											
Chillies, green	2.9	0.6	3.0	29	30	1.2	175.0	0.19	0.39	0.9	111.0
Ginger, fresh	2.3	0.9	12.3	67	20	2.6	40.0	0.06	0.03	0.6	6.0
<i>Fruits</i>											
Amla	0.5	0.1	13.7	58	50	1.2	9.0	0.03	0.01	0.2	600.0
Apple	0.2	0.5	13.4	59	10	1.0	0.0	—	—	0.0	1.0
Banana, ripe	1.2	0.3	27.2	116	17	0.9	78.0	0.05	0.08	0.5	7.0
Dates, dried	2.5	0.4	75.8	317	120	7.3	26.0	0.01	0.02	0.9	3.0
Guava, country	0.9	0.3	11.2	51	10	1.4	0.0	0.03	0.03	0.4	212.0
Grapes	0.5	0.3	16.5	71	20	0.5	0.0	—	—	0.0	1.0
Jack fruit (kat-hal)	1.9	0.1	19.8	88	20	0.5	175.0	0.03	0.13	0.4	7.0
Lime, sweet (musambi)	0.8	0.3	9.3	43	40	0.7	0.0	—	—	0.0	50.0
Mango, ripe	0.6	0.4	16.9	74	14	1.3	2743.0	0.08	0.09	0.9	16.0

1	2	3	4	5	6	7	8	9	10	11	12
Orange	0.7	0.2	10.9	48	26	0.3	1104.0	—	—	—	30.0
Papaya, ripe	0.6	0.1	7.2	32	17	0.5	666.0	0.04	0.25	0.2	57.0
Pears	0.6	0.2	11.9	52	8	0.5	28	0.06	0.03	0.2	0.0
Phalsa	1.3	0.9	14.7	72	129	3.1	419	—	—	0.3	22.0
Pomegranate (anar)	1.6	0.1	14.5	65	10	0.3	0	0.06	0.10	0.3	16.0
<i>Sea foods</i>											
Pomfrets, white	17.0	1.3	1.8	87	200	0.9	—	—	0.15	2.6	—
Rohu fish	16.6	1.4	4.4	97	650	1.0	—	0.05	0.07	0.7	22.0
<i>Other foods</i>											
Buffalo meat	19.4	0.9	—	86	3	—	—	—	—	—	—
Egg, hen (also contains 1200 I.U. Vitamin A)	13.3	13.3	—	173	60	2.1	600	0.10	0.40	0.1	0.1
Fowl	25.9	0.6	—	109	25	—	—	—	0.14	—	—
Goat meat	21.4	3.6	—	118	12	—	—	—	—	—	—
Liver, goat	20.0	3.0	—	107	17	—	—	—	—	—	—
Pork, muscle	18.7	4.4	—	114	30	2.2	0.0	0.54	0.09	2.8	2.0
<i>Milk and milk products</i>											
Buffalo milk	4.3	8.8	5.0	117	210	0.2	160*	0.04	0.10	0.1	1.0
Cow milk	3.2	4.1	4.4	67	120	0.2	174*	0.05	0.19	0.1	2.0
Goat milk	3.3	4.5	4.6	72	170	0.3	182*	0.05	0.01	0.3	1.0
Human milk	1.1	3.4	7.4	65	28	—	137*	0.02	0.02	—	3.0
Curds	3.1	4.0	3.0	60	149	0.2	102*	0.05	0.16	0.1	1.0



1	2	3	4	5	6	7	8	9	10	11	12
Butter milk	0.8	1.1	0.5	15	30	0.8	0.0	—	—	—	—
Channa, buffalo milk	13.4	23.0	7.9	292	480	—	—	—	—	—	—
<i>Fats and edible oils</i>											
Butter	—	81.0	—	729	—	—	3200*	—	—	—	—
Ghee (buffalo)	—	100.0	—	900	—	—	900*	—	—	—	—
Hydrogenated oil (fortified)	—	100.0	—	900	—	—	2500*	—	—	—	—
Cooking oil (groundnut)	—	100.0	—	900	—	—	0.0	—	—	—	—
Gingelly, mustard, coconut, etc.											
<i>Miscellaneous foodstuffs</i>											
Bread, brown	8.8	1.4	49.0	244	18	2.2	—	0.21	—	2.5	—
Bread, white	7.8	0.7	51.9	245	11	1.1	—	0.07	—	0.7	—
Cane sugar	0.1	0.0	99.4	398	12	—	—	—	—	—	—
Sago	0.2	0.2	87.1	351	10	1.3	—	0.01	—	0.2	—

\*These values represent International Units of Vitamin A.

Note : Dietary allowances for vitamin A are given both in terms of retinol (performed vitamin A) and B carotene, and the required amounts of vitamin A can be obtained from either or both. Although by definition, 1 gm. of B carotene is equivalent to more than 0.5 mg. (1666 I.U.) of retinol, some studies indicate that for all practical purposes it may be taken as equivalent to 0.25 mg. of retinol, because of the inefficiency of utilisation of carotene as a source of vitamin A. The total vitamin A value of a diet in terms of retinol can be calculated as follows :—

Total vitamin A value as Retinol (ug) — Retinol (ug) + B Carotene (ug)

4

## ANNEXURE 4

## DEMOGRAPHIC PROFILE AND VITAL STATISTICS

Table 1. Demographic profile

Population (1981 census)	685 million
Children 0-14 yrs	269 million (38.3%)
Children 0-6 yrs	111 million (16.2%)
Birth rate	33.2
Death rate	12.5
Infant mortality rate	114 per 1000
Mortal'ity 0-4 years	41.8 per 1000
Expectation of life at birth—males	52.0 years
Expectation of life at birth—females	51.6 years

(Source :— Health Statistics of India, Ministry of Health and Family Welfare, Government of India, 1983).

Table 2. Socio-economic Indicators

*Per capita national income (1981-82)*

At current prices	Rs. 1749.5
At 1970-71 prices	Rs. 719.9

Per capita net availability of food grains (1980-81) 451 g.

**Percentage of people below poverty line**

Rural	50.82
Urban	38.19
Combined	48.13

**Literacy level (1981 census)**

Total	36%
Males	47%
Females	25%
Rural	29.5%
Urban	57.0%



**Table 3. Rural Health Infrastructure (1982-83)**

Primary Health Centres	5,955
Sub-centres	65,643
Up-graded PHCs	471
Village Health Guides	233,000
Trained TBAs	400,000

(Source : Health Statistics of India, 1983).

## ANNEXURE 5

## WEANING FOODS AND MEASURES

Table 1. Weaning foods which can be prepared at home

<b>Sago Kanjee</b>		
Sago		25 g
Roasted Bengal gram		25 g
Jaggery		25 g
Water (cups)		2
<i>Method</i>		
Roast sago and powder Bengal gram. Add sago to $1\frac{1}{2}$ cups of boiling water and cook. Prepare a batter of Bengal gram powder in 1 cup of water and pour it into the cooked sago, stirring continuously. Cook for 10 minutes. Add jaggery and cook for five minutes again.		
<b>Porridge of wheat dalia</b>		
Wheat Dalia		50 g
Sugar		15 g
Milk		50 g
<i>Method</i>		
Roast wheat dalia and add to boiling water containing 2 bay leaves and cook until it is soft, then add sugar and boiled milk.		
<b>Ragi porridge</b>		
Ragi flour roasted		50 g
Bengal gram dal flour (roasted)		4 teaspoons
Groundnut cake powder (roasted)		4 teaspoons
Jaggery		20 g
<i>Method</i>		
Boil jaggery solution. Mix ragi and Bengal gram flours and make a batter with hot water. Pour the batter slowly into the jaggery solution, stirring continuously. Boil for 10-15 minutes. Serve warm.		
<b>Bajra Infant food</b>		
Bajra		50 g
Green gram dal		3 teaspoons
Skim milk powder		2 teaspoons
Groundnuts		2 teaspoons
Til seeds		1 teaspoon
Sugar or salt		to taste



*Method*

Clean and dehusk bajra. Roast and powder bajra, green gram dal, groundnut and til seeds. Mix all the powders together with skim milk powder and store in an air tight container. Whenever required, mix the powder with boiling water or milk to desired thickness. Add salt or sugar.

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**Khichri**

Rice	50 g
Lentil	25 g
Spinach	50 g
Oil	2 teaspoons
Salt	to taste

*Method*

Cook rice and dal together and mash. Boil spinach, mash and strain. Add this spinach purce, salt and heated oil to the rise dal mixture, stir and serve.

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**Bengal gram dal khichri**

Rice	50 g
Green gram dal	25 g
Roasted Bengal gram	50 g
Green leafy vegetable	25 g
Oil	1 teaspoon
Salt	to taste

*Method*

Boil and mash rice and green gram dal. Boil, mash and strain the spinach. Add this spinach, powdered Bengal gram and salt, to the rice and dal mixture and cook for a few minutes. Season with oil.

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**Khichri of wheat dalia**

Wheat dalia	50 g
Lentil	50 g
Potato	in amounts desired
Any green vegetable	in amounts desired
Oil	3 teaspoons
Salt	to taste
Onion	1 small
Ginger	2 g
Bay leaf and cardamom (optional)	1 each

*Method*

Clean and wash dalia and lentil separately and cut vegetables. To boiling water add, onion, ginger, bay leaf, cardamom and dalia. Cook until half cooked. Then add lentil and vegetables and cook until soft. Season with salt and oil.

**Khichri of rice, dal and vegetables**


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Rice	50 g
Dal (lentil)	25 g
Potato	in amounts desired
Any vegetable	in amounts desired
Oil	3 teaspoons
Salt	to taste
Onion	5 g
Ginger (optional)	2 g
Bay leaf (optional)	1 g

*Method*

Clean and wash rice and lentil separately and cut vegetables small. To boiling water add, a piece of onion, ginger, bay leaf, cardamom and rice. Cook until half cooked. Then add lentil and vegetables and cook until soft. Season with oil and salt. This can be made without vegetables also.

**Rice uppuma**


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Rice	25 g
Green gram dal	25 g
Onion	1 large
Any vegetable	10 g
Mustard	$\frac{1}{2}$ teaspoon
Groundnut oil	4 teaspoons
Salt	to taste
Water	2 cups

*Method*

Roast rice and dal and grind into granules. Cook green gram dal with  $\frac{3}{4}$  cup water and mash. To hot oil, add mustard, onion and fry and then add water and salt. Add the rice granules and the vegetables to the water and stir. Cook for 10 minutes and add the green gram dal paste. Drumstick leaves may also be used instead of vegetables.

**Chapatis with atta; Bengal gram powder and leafy vegetables**


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Atta	3 parts
Bengal gram powder	1 part
Green leafy vegetables	as desired



*Method*

Chop, boil and mash leafy vegetables. Mix the mashed vegetables and Bengal gram flour with the atta and make a dough and prepare the chapatis.

**Sweet dal**

Rice	30 g
Red gram dal	60 g
Spinach	30 g
Jaggery	60 g

*Method*

Roast and powder rice and red gram dal. Mix the two and make a batter with cold water. Boil mash and strain spinach. Mix the batter and spinach pure with jaggery syrup and cook for a few minutes.

**Khaman dhokla**

Bengal gram dal	50 g
Black gram dal	25 g
Rice	50 g
Amaranth leaves	50 g
Curd	25 g
Oil	1 teaspoon
Salt	to taste
Mustard	a few seeds

*Method*

Soak Bengal gram dal, black gram dal and rice separately for a few hours. Grind them separately and mix. Add curd and salt and ferment the mixture overnight. Add amaranth leaves, season with oil and mustard seeds, and pour the batter into idly moulds and steam.

**Ragi adai-sweet**

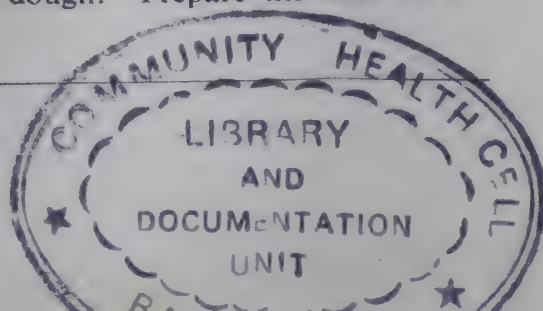
Ragi flour	30 g
Roasted Bengal gram dal	3 teaspoons
Jaggery	15 g
Coconut scrapings	1 teaspoon
Oil (groundnut)	2 teaspoons
Water	3 teaspoons

*Method*

Dissolve jaggery in water. Add Bengal gram flour, ragi flour and coconut scrapings to the jaggery water to make a thick dough. Prepare the adai on a greased iron pan 'tawa'.

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**Cholam (jawar) puttu**

Cholam flour	30 g
Roasted Bengal gram dal flour	25 g
Coconut scrapings	5 g
Jaggery	20 g
Salt	1 pinch
Water	2 cups

**Method**

Mix cholam flour, Bengal gram flour, coconut scrapings and salt together. Sprinkle two spoonfuls of water and then mix and steam for 15 minutes. Mix jaggery powder and serve.

**Laddoos of groundnuts and gingelly seeds**

Groundnut	25 g
Jaggery	25 g
Gingelly seeds	half of groundnut and jaggery

**Method.**

Roast groundnut and gingelly seeds. Pound them with jaggery. Make small balls with the mixture.

**Panjiri**

Wheat atta	75 g
Jaggery or sugar	15 g
Oil or ghee	2 teaspoons

**Method**

Roast wheat atta in oil till light brown colour. Add jaggery to it and mix well.

**Sattu**

Soak barley overnight. Dry a little, roast and grind. Mix with sugar or jaggery according to taste.

**Suji kheer**

Suji	25 g
Sugar	10 g
Milk	250 ml

**Method**

Boil milk and add suji. Keep on a slow fire till it becomes semi-solid. Add sugar.



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**Rice kheer**

Rice	25 g
Sugar	10 g
Milk	250 ml

**Method**

Clean, pick and wash rice. Boil milk, add rice and cook till semi-solid. Add sugar.

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**Rice kanjee**

Rice	100 g
Water	400 to 500 ml
Salt	1.5 to 2 g

**Method**

Clean, pick and wash rice. Add rice to water and cook till soft, adding salt.

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**Poha (leftover rice)**

Rice
Onions
Potatoes or other vegetables

**Method**

Brown onions in oil and add cumin and mustard seeds. Add vegetables and cook till tender, adding minimum quantity of water. Finally add rice, cook for 2-3 minutes.

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Table 2. Selected Nutritious Recipes

**Ragi Malt***Ingredients**Quantity*

Ragi

Sufficient to make flour for one month's use.

*Method*

1. Clean the grain.
2. Wash it well and soak in double the volume of water for 16 hours or a little over half a day.
3. After soaking, scrub the grain in water and remove the seed coat by washing it in water.
4. Let it soak for 3 more hours.
5. Drain off the water and spread the ragi on a plate or cloth.
6. Cover with a damp cloth and keep it for one day. During this period, the grain will germinate. This is known as malting.
7. The next day the ragi should have a small sprout resembling a small white dot. Do not allow the sprout to grow long as this imparts a taste which is not acceptable to children.
8. Dry the grain in the sun by spreading it on a tray or a dry cloth.
9. Roast it lightly in an iron pan to develop the characteristic malt flavour. (Do not over-roast).
10. Powder it to a fine flour.
11. Sieve the powder. (This is not necessary for older children).
12. Store it in an air-tight container. This will keep for one month.

Malting (sprouting) changes some of the carbohydrate into a more easily digestible form for babies. There is also a slight increase in the vitamin B complex content.

**Bajra Infant Food***Ingredients**Quantity**Household Measures*

Bajra	60 g	$\frac{1}{2}$ katori
Green gram dal	15 g	1 tb sp
Skim milk powder	10 g	2 tsp
Groundnuts	10 g	7-8 nuts
Til seeds	5 g	1 tsp
Sugar	50 g	$\frac{1}{2}$ katori



Method

- 1. Pick bajra, remove the husk as completely as possible, roast and powder it.
- 2. Roast green gram dal, and groudnuts separately.
- 3. Pound roasted groundnuts and roasted dal to a flour in a mortar.
- 4. Mix all the powders. (It can be stored in air-tight bottles and used whenever required).
- 5. Mix the powder with the desired quantity of boiled water or milk and sugar and heat it lightly. (Salt may be used instead of sugar).
- 6. Serve.

Puffed Rice-Gram Gruel

Ingredients	Quantity	Household Measures
Puffed rice	50 g	2½ katoris
Roasted bengal gram	50 g	1 katori
Spinach	30 g	7-8 leaves
Jaggery/Sugar	50 g	½ katori
Water	As required	

Method

- 1. Dehusk the roasted bengal gram.
- 2. Roast the puffed rice slightly.
- 3. Powder both the ingredients.
- 4. Make jaggery syrup and strain it.
- 5. Add this jaggery syrup to the powdered mixture.
- 6. Boil the spinach, mash and sieve it.
- 7. Add spinach puree to the batter.
- 8. Cook on slow heat till it thickens.

Wheat-Green Gram Laddoo

Ingredients	Quantity	Household measures
Wheat flour	50 g	½ katori
Green gram dal (washed)	50 g	½ katori
Sugar/Jaggery	100 g	1 katori
Fat	30 g	2 tb sp

Method

- 1. Roast wheat flour and green gram dal separately till light brown.
- 2. Grind the green gram dal to a fine powder.
- 3. Mix wheat flour and green gram dal powder and fry for 10 minutes in hot fat.
- 4. Remove from fire and add powdered sugar jaggery.
- 5. Prepare small balls (laddoos).

Variations : (a) Any combination of a cereal-pulse mixture can be used instead of wheat flour-green gram dal.

(b) Laddoos of any dal or cereal alone may also be prepared similarly.

**Sweet Besan Chappaties**

Ingredients	Quantity	Household Measures
Besan	30 g	$\frac{1}{2}$ katori
Wheat flour	60 g	$\frac{3}{4}$ katori
Jaggery	70 g	$\frac{3}{4}$ katori
Fat	5 g	1 tsp
Water	60 ml	$\frac{1}{2}$ katori

*Method*

1. Mix jaggery with water and prepare a syrup.
2. Mix besan, wheat flour and syrup.
3. Knead thoroughly to make a soft dough.
4. Prepare small balls and roll into thin chappaties.
5. Cook on a hot tawa on both sides.
6. Apply fat and serve hot.

*Variation :* Poories may also be made from the same combination.

**Wheat-Besan Halwa**

Ingredients	Quantity	Household Measures
Wheat flour	30 g	$\frac{1}{3}$ katori
Besan	20 g	$\frac{1}{3}$ katori
Sugar	45 g	$\frac{1}{2}$ katori
Fat	20 g	$1\frac{1}{3}$ Tb sp
Water	200 ml	$1\frac{1}{2}$ katori

*Method*

1. Roast wheat flour and besan separately till light brown.
2. Mix wheat flour and besan together.
3. Fry besan and wheat flour for 10 minutes.
4. Add sugar and cook for 10 minutes. Keep stirring.
5. Add water. Cook till it leaves the sides of the degchi.
6. Serve hot.

**Groundnut Chikki**

Ingredients	Quantity	Household Measures
Groundnuts	50 g	$\frac{1}{2}$ katori
Jaggery	100 g	1 katori
Fat	5 g	1 tsp
Water	25 ml	2 tb sp



*Method*

1. Clean and roast groundnut seeds till light brown.
2. Remove the skin, and pound the groundnuts.
3. Mix jaggery and water. Bring it to a boil.
4. Filter through a muslin cloth.
5. Cook to a hard ball consistency (i.e. when a drop of jaggery is put in a katori of cold water, it should become hard and brittle).
6. Add groundnuts.
7. Grease a tray with fat.
8. Pour brittle on the tray and spread it.
9. Cut into square pieces when cool.

*Variation :* Groundnuts may be substituted with puffed rice, chana dal or maize.

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Source : "Selected Nutrition Recipes"—1983. National Institute of Public Cooperation and Child Development, New Delhi.

## ANNEXURE 6

## INDIGENOUS CALENDAR

Festivals	1985	1986	1987	1988	1989	1990
Amavasya		10 Jan			7 Jan	
Lohri	13 Jan	13 Jan	13 Jan	13 Jan	13 Jan	14 Jan
Republic Day	26 Jan	26 Jan	26 Jan	26 Jan	26 Jan	26 Jan
Purnima	7 Jan	25 Jan	15 Jan	4 Jan	21 Jan	11 Jan
Amavasya	21 Jan	8 Feb	29 Jan	19 Jan	6 Feb	26 Jan
Basant Panchami		13 Feb	3 Feb	23 Jan	10 Feb	31 Jan
Purnima	5 Feb	24 Feb	13 Feb	2 Feb	20 Feb	9 Feb
Shiv Ratri	17 Feb	8/9 Mar	26 Feb	16 Feb	6 Mar	24 Feb
Amavasya	19 Feb	10 Mar	27 Feb	17 Feb	7 Mar	25 Feb
Holi (Purnima)	7 Mar	26 Mar	15 Mar	3 Mar	21 Mar	10 Mar
Dhulendi (Holi)	7/8 Mar	27 Mar	16 Mar	4 Mar	22 Mar	11 Mar
Amavasya	21 Mar	9 Apr	29 Mar	18 Mar	6 Apr	26 Mar
Ram Navmi	30 Mar	18 Apr	7 Apr	26 Mar	14 Apr	3 Apr
Purnima	5 Apr	24 Apr	14 Apr	2 Apr	21 Apr	10 Apr
Baisaki	13 Apr	13 Apr	13 Apr	13 Apr	13 Apr	13 Apr
Amavasya	20 Apr	8 May	28 Apr	16 Apr	5 May	25 Apr
Budh Purnima	5 May	23 May	13 May	1 May	20 May	9 May
Amavasya	19 May	7 June	27 May	15 May	3 June	24 May
Nirajala Akadasi	30 May	18 June	8 June	26 June	14 & 15 June	3 & 4 June
Purnima	3 June	22 June	11 June	31 May	19 June	8 June
Amavasya	18 June	7 July	26 June	14 June	3 July	22 June
Purnima	2 July	21 July	11 July	29 June	18 July	8 July
Amavasya	17 July	5 Aug	25 July	13 July	1 Aug	22 July
Teej		8 Aug	29 July	15 Aug	4 Aug	24 July
Purnima	31 July			29 July		
Amavasya	16 Aug			12 Aug		
Independence Day	15 Aug	15 Aug	15 Aug	15 Aug	15 Aug	15 Aug
Raksha Bandan (Purnima)	30 Aug	19 Aug	9 Aug	27 Aug	17 Aug	6 Aug



Festivals	1985	1986	1987	1988	1989	1990
<b>Janam Ashtami</b>	7 Sept	27 Aug	16 Aug	3 Sept	24 Aug	14 Aug
<b>Amavasya</b>	14 Sept	4 Sept	24 Aug	11 Sept	31 Aug	20 Aug
<b>Anant Chaudasi</b>	27 Sept	17 Sept	6 Sept	24 Sept	14 Sept	4 Sept
<b>Purnima</b>	28 Sept	18 Sept	7 Sept	25 Sept	15 Sept	5 Sept
<b>Amavasya</b>	14 Oct	3 Oct	23 Sept	10 Oct	29 Sept	18 Sept
<b>Purnima</b>	28 Oct	17 Oct	7 Oct	25 Oct		
<b>Gandhi Jayanti</b>	2 Oct	2 Oct	2 Oct	2 Oct	2 Oct	2 Oct
<b>Sharad</b>				25 Oct	14 Oct	
<b>Navratri</b>	23 Oct	12 Oct	20 Oct	19 Sept	8 Oct	27 Sept
<b>Dussehra</b>	22 Oct	12 Oct	2 Oct	20 Oct	10 Oct	29 Sept
<b>Amavasya</b>						4 Oct
<b>Purnima (Maharishi</b>						
<b>Valmiki's B'Day)</b>	28 Oct				14 Oct	
<b>Diwali (Amavasya)</b>	12 Nov	1 Nov	22 Oct	9 Nov	29 Oct	18 Oct
<b>Gobardhan Pooja</b>	13 Nov	2 Nov	23 Oct	10 Nov	30 Oct	19 Oct
<b>Bhaiya Dooj</b>	14 Nov	3 Nov	24 Oct	11 Nov	31 Oct	20 Oct
<b>Ganga Snan Purnima</b>	27 Nov	16 Nov	5 Nov	23 Nov	13 Nov	2 Nov
<b>Amavasya</b>	11 Dec	1 Dec	21 Nov	9 Dec	28 Nov	17 Nov
<b>Purnima</b>	27 Dec	16 Dec	5 Dec	23 Dec	12 Dec	2 Dec
<b>Christmas Day</b>	25 Dec	25 Dec	25 Dec	25 Dec	25 Dec	25 Dec
<b>Amavasya</b>		31 Dec	20 Dec		28 Dec	17 Dec
<b>Muharram</b>	17 Sept	7 Sept	27 Aug	15 Aug	4 Aug	24 July
<b>Id-UI Fittak</b>						
<b>(Ramzan Id)</b>	22 May	11 May	30 May	18 Apr		

## ANNEXURE 7

## ADDITIONAL READING

1. *An Analysis of the Situation of Children in India*, UNICEF, 73, Lodi Estate, New Delhi - 110 003, 1981, pp. 91. Free.
2. *A Hand Book of Tropical Paediatrics*, Ebrahim G.J. ELBS 1978, available from VHAI.
3. *Better Child Care*, Helen Laugesen VHAI 1976, pp. 52, Rs. 3.50.
4. *Breast is Best*, Penny & Stanway Andrew Rupe and Co. New Delhi 1984, available from VHAI.
5. *Breast Feeding in Practice*—A Manual for health workers, Helsing Elisabet and King Savege F, Oxford, New York 1982, available from VHAI and Oxford Univ. Press, Walton Street Oxford OX 26 D.P. England.
6. *Breast Feeding—the Biological Option* Ebrahim G.J. ELBS 1978, available from VHAI.
7. *Child Atlas of India*, UNICEF, New Delhi 73, Lodi Estate, New Delhi-110003, 1981 pp. 52, Gratis.
8. *Children in India*, Alfred D'souza, Manohar Publications, 2 Ansari Road, Daryaganj, New Delhi - 110 002, 1979, pp. 262 Rs. 70/-.
9. *Care of the Newborn in Deevloping Countries*, Ebrahim G.J. ELBS, 1979, available from VHAI.
10. *Child Care in the Tropics*, Ebrahim G.J., ELBS 1978, available from VHAI.
11. *Community Based Nutrition Programmes*, Rihde. J., Management Sciences for health, Port-An-Prince Haiti July 1982.
12. *Diet Atlas of India*, Gopalan C & Balasubramanian S.C. Rama Sastri B.V. and Visveswara Rao K National Institute of Nutrition, Hyderabad, 1971.
13. *Diarrhoea and Malnutrition*, Lincoln C. Chen and Nevin S. Scrinshaw, Plenus Press, 233 Spring Street, New York—10013 USA, 1983, pp.318 Rs. 150/-.
14. *Dictionary of Baby and Child Care*, Shanti Ghosh, Vikash Publishing House Pvt. Ltd., Gaziabad, U.P. 1982. pp. 203 Rs. 12/-.
15. *Early Detection and Prevention of Protein Calorie Malnutrition*, P.M. Shah Popular Prakashan Pvt. Ltd., 35, Tardeo Road, Popular Press Building, Bombay 400 034 1974, pp 75 Rs. 15/- available from VHAI Refer. No. 50.
16. *Fiel Anthropometry Independent of Precise Age*, J. Pediatr 1969.
17. *Growth Monitoring*, Griffiths M, American Public Health Association (International Health Programmes) Primary Health Care Issue, Series 1, No. 3, Oct. 1981.
18. *Human Nutrition and Dietetics*, Davidson S. Passmore R and Brock J.F. ELBS and Churchill Livingstone, Edinburgh 1973, pp. 556.
19. *Handbook of Human Nutrition Requirements*, WHO Monograph Series No. 61, Geneva, 1974; FAO Nutritional Studies, No. 28, Rome 1974.
20. *Health Care of Children Under Five*, Voluntary Health Association of India 1973, pp. 95.



21. *Handbook for Nutrition Trainers of Anganwadi Workers*, NIPCCD 1984, pp. 150 free.
22. *Infant Nutrition in the Subtropics and Tropics*, Jelliffe D.B., WHO Monograph No. 29, Geneva 1955.
23. *Interactions of Nutrition and Infection*, Scrimshaw, N.S., Taylor C.E. and Gerdon J.E. WHO Monograph Series 57, Geneva 1968.
24. *Immunizing More Children*, UNICEF, 73, Lodi Estate, New Delhi 110 003 1984—free.
25. *Infant Feeding Practices in an Urban Slum—a Report*, Meera Shekar NIPCCD 5, Siri Institutional Area, Hauz Khas, New Delhi-16 1983, pp. 55 free.
26. *Infant Feeding Practices with Special Reference to the Use of Commercial Infant Foods*, P.V. Gopujkar et al, Nutrition Foundation of India, Gulmohar Park, New Delhi 1984, pp. 115 free.
27. *Statement and Recommendations*, Joint WHO/UNICEF Meeting on Infant and Young Child Feeding WHO 1981.
28. *Infant and Young Child Feeding*, Current issue WHO 1981.
29. *Integrated Child Development Services Scheme*, Ministry of Education & Social Welfare, Shastri Bhawan, New Delhi, 1979, pp. 33 free.
30. *Mother and Child Health—Delivering the Services*, Williams and David Jelliffe Twentieth Century Publications, New Delhi 110 001 1972, pp. 164.
31. *Manual of Immunization*, Mass Mailing Unit, Ministry of Health, GOI, Kotla Road New Delhi 110002, 1977, pp. 44 free.
32. *Manual of Child Nutrition in Rural India*, Cecile De Sweemer et al VHAI & Concept Pub. Co. 65 F, Anand Nagar Delhi-5
33. *Manual of Paediatrics*, Prasad Surajnandan Prof. Orient Longman, Asaf Ali Road, New Delhi 1973, pp. 648.
34. *Manual on Feeding Infants and Young Children*, Cameron Margaret & Hofvander Yngve Oxford Univ. Press, 1976 & 83.
35. *Manual On Feeding In Practice*, Cameron Margaret and Hofvander Yngve, manual for health workers Oxford, New Delhi 1983 available from VHAI.
36. *Manual on Nutrition in Primary Health Care*, WHO.
37. *Nutrition and Health Education Through the Rural Health System*, Nutrition Foundation of India, Gulmohar Park, New Delhi 1984, pp. 35 free.
38. *Nutritive Value of Indian Foods*, National Institute of Nutrition, Hyderabad 1984, pp. 204 Rs. 9/- available from VHAI.
39. *Nutritional Disabilities*, NIN, Hyderabad, AP 500 007, 1981, pp. 59.
40. *Paediatric Priorities in the Developing World*, Morley David, Butterworths, London, 1973, pp 434.
41. *Profile of the Child in India*, Policies and Programmes, Ministry of Social Welfare Govt. of India, Shastri Bhavan, New Delhi, 1980. pp. 371 free.
42. *Paediatric Drug Directory*, Gupte Suraj & Smith Rita, Jaybee Brothers, Medical pub. 85-A, Kamla Nagar, Delhi-7. 1979, pp. 106.



43. *Play Activities for Young Children*. Mina Swaminathan UNICEF, New Delhi 1984, pp. 97 free.
44. *Practical Mother and Child Health in Developing Countries*, Ebrahim G.J. ELBS 1978 available from VHAI.
45. *Requirements of Vitamin A, Thiamine, Riboflavin and Niacine*, Technical Reports Series No. 363, 1967, WHO.
46. *Studies on Value of Indian Foods*, ICMR, Medical Enclave, Ansari Nagar, New Delhi 1977, pp. 779, Rs. 4/- available from VHAI.
47. *See How They Grow*, David Morely and Margaret Woodland 1979 Macmillan Tropical Community Health Manuals Series, G. Briton.
48. *The Assessment of the Nutritional Status of the Community*, WHO Monograph No. 53, Geneva 1966.
49. *The State of the World's Children*, 1984 and 1985, UNICEF 1984, pp. 42 1985 pp. 78, Both Free.
50. *Timely Health Care of Children and Mothers*, P.M. Shah and Kusum Shah Popular Prakashan, 350, Tardeo Road, Popular Prakashan Building, Bombay-400 034 1978, pg. 54 (Disease symptoms—remedies).
51. *Nutrition and Dev. of the Child*, R. Rajalakshmi Biochemistry Dept. M.S. Univ. of Baroda, Baroda 1983. □









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